AJ Institute of Engineering and Technology Mangaluru.

VTU Question Papers

BE-CSE, ISE & Allied Branches

[CSE-AIML, CSE-ICB, AIDS]

III toVIII Semester

2022 SCHEME

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CBCS SCHEME

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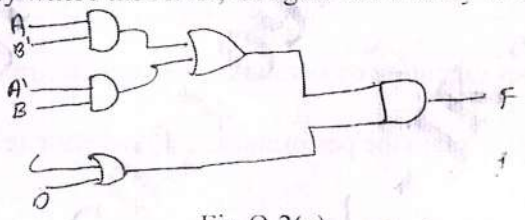
BCS302

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Digital Design and Computer Organization

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Obtain a minimum product of sums with a Karnaugh map. F(w, x, y, z) = x′ z′ + wyz + w′ y′ z′ + x′ y.	10	L3	CO1
	b.	Find the minimum sum of products for each function using a Karnaugh map i) $F_1(a, b, c) = M_0 + M_2 + M_5 + M_6$ ii) $F_2(d, e, f) = \sum m(0, 1, 2, 4)$ iii) $F_3(r, s, t) = rt' + r's' + r's$	10	L3	CO1
		OR			
Q.2	a.	Identify the prime implicants and essential prime implicants of the following functions: i) f(A, B, C, D) = Σ (1, 3, 4, 5, 10, 11, 12, 13, 14, 15) ii) f(W, X, Y, Z) = Σ(0, 1, 2, 5, 7, 8, 10, 15).	10	L3	CO1
	b.	Write the verilog code for the given expression using dataflow and behavioral model where Y = (AB′ + A′B) (CB + AD) (AB′C + AC).	5	L2	CO1
	c.	Write the verilog code and time diagram for the given circuit with propagation delay where the AND, OR gate has a delay of 30ns and 10ns.  Fig.Q.2(c)	5	L2	CO1
		Module – 2			
Q.3	a.	What is Latch? With neat diagram, explain S-R latch using NOR gate. Derive characteristics equation.	10	L3	CO2
	b.	What is priority encoder? Design 4:2 priority encoder with necessary diagrams.	10	L3	CO2
		OR			
Q.4	a.	Design and explain four bit adder with carry look ahead.	10	L3	CO2
	b.	What is multiplexer? Design 9:1 mux using 2:1 mux.	10	L3	CO2

		Module – 3			
Q.5	**a.**	Explain four types of operation performed by computer with an example.	**10**	**L2**	**CO3**
	b.	Show how below expression will be executed in one address, two address zero address and three address processor in an accumulator organization X = (A * B) + (C * D).	**10**	**L1**	**CO3**
		OR			
Q.6	**a.**	What is addressing mode? Explain different types of addressing mode with an examples.	**10**	**L2**	**CO3**
	b.	With a neat diagram, explain basic operational concepts of a computer.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the following with respect to interrupts with diagram. i) Vector interrupt ii) Interrupt nesting iii) Simultaneous request.	**10**	**L2**	**CO3**
	b.	Explain Direct Memory Access with a neat diagram.	**10**	**L2**	**CO3**
		OR			
Q.8	**a.**	What is Bus arbitration? Explain different types of bus arbitration.	**10**	**L2**	**CO3**
	b.	Discuss different types of mapping functions of coaches.	**10**	**L2**	**CO3**
		Module – 5			
Q.9	**a.**	Draw and explain the single-bus organization of the data path inside a processor.	**10**	**L2**	**CO4**
	b.	List out the actions needed to execute the instruction ADD (R3), R1 write and explain the sequence of control steps for the execution of the same.	**10**	**L2**	**CO4**
		OR			
Q.10	**a.**	Analyze how does execution of a complete instruction carry out.	**10**	**L4**	**CO4**
	b.	What is pipeline? Explain the performance of pipeline with an example.	**10**	**L4**	**CO4**

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BCS303

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Operating Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Operating System. Explain dual mode of OS with a neat diagram.	5	L1, L2	CO1
	b.	Distinguish between the following terms: i) Multiprogramming and Multitasking ii) Multiprocessor system and clustered system.	10	L2	CO1
	c.	With a neat diagram, explain the concept the concept of VM-WARE architecture.	5	L1, L2	CO1
		OR			
Q.2	a.	Explain the operating system services with respect to programs and users.	5	L2	CO1
	b.	List and explain the different computing environments.	5	L1, L2	CO1
	c.	What are system calls? List and explain the different types of system calls.	10	L1, L2	CO1
		Module – 2			
Q.3	a.	Define process. Explain different states of a process with state diagram.	8	L1, L2	CO1
	b.	What is IPC? Explain direct and indirect communication with respect to message passing.	8	L1, L2	CO2
	c.	Explain context-switching.	4	L2	CO2
		OR			
Q.4	a.	What is multi-threaded process? Explain the four benefits of multithreaded programming.	6	L2	CO2
	b.	Calculate the average waiting time and average turn around time by drawing the Gantt-chart using FCFS, SJF-non preemptive, SRTF, RR(q = 2ms) and porosity algorithms.	14	L3	CO2

Process	Arrival time	Burst time	Porosity
P1	0	9	3
P2	1	4	2
P3	2	9	1
P4	3	5	4

		Module – 3			
Q.5	a.	What is critical section? What are the requirements for the solution to critical section problem? Explain Peaterson's solution.	8	L1, L2	CO3
	b.	Explain Reader's-Writer's problem using semaphores.	12	L2	CO3

OR

Q.6	**a.**	What is deadlock? What are the necessary conditions for the deadlock to occur?	**6**	**L1, L2**	**CO3**
	b.	Consider the following snap-shot of a system: Answer the following using Banker's algorithm: i) Is the system in safe state? If so give the safe sequence. ii) If process P2 requests (0, 1, 1, 3) resource can it be granted immediately.	**14**	**L3**	**CO3**

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	2	0	0	1	4	2	1	2	3	3	2	1
P1	3	1	2	1	5	2	5	2				
P2	2	1	0	3	2	3	1	6				
P3	1	3	1	2	1	4	2	4				
P4	1	4	3	2	3	6	6	5				

Module – 4

Q.7	**a.**	What is paging? Explain with neat diagram paging hardware with TLB?	**10**	**L1, L2**	**CO4**
	b.	What are the commonly used strategies to select a free hole from the available holes?	**6**	**L1**	**CO4**
	c.	Explain fragmentation in detail.	**4**	**L2**	**CO4**

OR

Q.8	**a.**	With a neat diagram? Describe the steps in handling the page fault.	**8**	**L2**	**CO4**
	b.	Consider the page reference string: 1, 0, 7, 1, 0, 2, 1, 2, 3, 0, 3, 2, 4, 0, 3, 6, 2, 1 for a memory with 3 frames. Determine the number of page faults using F1, F0, optimal and LRU replacement algorithms which algorithm is more efficient.	**12**	**L3**	**CO4**

Module – 5

Q.9	**a.**	Define file. List and explain the different file attributes and operations.	**10**	**L1**	**CO5**
	b.	Explain the different allocation methods.	**10**	**L2**	**CO5**

OR

Q.10	**a.**	What is Access Matrix? Explain Access Matrix method of system protection with domain as objects and its implementation.	**10**	**L1, L2**	**CO5**
	b.	A drive has 5000 cylinders numbered 0 to 4999. The drive is currently serving a request 143 and previously serviced a request at 125. The queue of pending requests in FIFO order is: 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 starting from current head position. What is the total distance travelled (in cylinders) by disk arm to satisfy the requests using FCFS, SSTF, SCAN, LOOK and C-LOOK algorithm.	**10**	**L3**	**CO5**

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CBCS SCHEME

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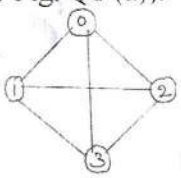
BCS304

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Data Structures and Applications

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Data Structures. Explain with neat block schematic different type of data structures with examples. What are the primitive operations that can be performed?	10	L2	CO1
	b.	Differentiate between structures and unions shown examples for both.	5	L1	CO1
	c.	What do you mean by pattern matching? Outline knuth, Morris, Pratt pattern matching algorithm.	5	L2	CO1
		OR			
Q.2	a.	Define stack. Give the implementation of Push ( ), POP ( ) and display ( ) functions by considering its empty and full conditions.	7	L2	CO1
	b.	Write an algorithm to evaluate a postfix expression and apply the same for the given postfix expression 6, 2, /, 3, -, 4, 2, *, +	7	L3	CO1
	c.	Write the Postfix form of the following using stack : (i) A*(B*C+D*E) + F (ii) (a + (b*c) / (d-e))	6	L3	CO1
		Module – 2			
Q.3	a.	What are the disadvantages of ordinary queue? Discuss the implementation of circular queue.	8	L2	CO2
	b.	Write a note on multiple stacks and priority queue.	6	L2	CO2
	c.	Define Queue. Discuss how to represent queue using dynamic arrays.	6	L2	CO2
		OR			
Q.4	a.	What is a linked list? Explain the different types of linked lists with neat diagram.	4	L2	CO2
	b.	Give the structure definition for singly linked list (SLL). Write a C function to, (i) Insert on element at the end of SLL. (ii) Delete a node at the beginning of SLL.	8	L3	CO2
	c.	Write a C-function to add two polynomials show the linked list representation of below two polynomials $p(x) = 3x^{14} + 2x^8 + 1$ $q(x) = 8x^{14} - 3x^{10} + 10x^6$	8	L3	CO2
		Module – 3			
Q.5	a.	Write a C-function for the following operations on Doubly Linked List (DLL): (i) addition of a node. (ii) concatenation of two DLL.	8	L3	CO3
	b.	Write C functions for the following operations on circular linked list : (i) Inserting at the front of a list. (ii) Finding the length of a circular list.	8	L3	CO3

	c.	For the given sparse matrix, give the diagrammatic linked representation. $A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 4 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 8 & 0 & 0 & 1 \\ 0 & 0 & 6 & 0 \end{bmatrix}$.	4	L3	CO3
		OR			
Q.6	a.	Discuss how binary tree are represented using, (i) Array (ii) Linked list	6	L2	CO3
	b.	Discuss inorder, preorder, postorder and level order traversal with suitable recursive function for each.	8	L2	CO3
	c.	Define Threaded Binary Tree. Discuss In-Threaded binary Tree.	6	L2	CO3
		Module – 4			
Q.7	a.	Write a function to perform the following operations on Binary Search Tree (BST): (i) Inserting an element into BST. (ii) Recursive search of a BST.	8	L3	CO4
	b.	Discuss selection Trees with an example.	8	L2	CO4
	c.	Explain Transforming a first into a binary tree with an example.	4	L2	CO4
		OR			
Q.8	a.	Define graph. Show the adjacency matrix and adjacency list representation of the graph given below (Refer Fig. Q8 (a)).  Fig. Q8 (a)	6	L3	CO4
	b.	Define the following Terminologies with examples, (i) Digraph (ii) Weighted graph (iii) Self loop (iv) Parallel edges	8	L1	CO4
	c.	Explain in detail elementary graph operations.	6	L2	CO4
		Module – 5			
Q.9	a.	What is collision? What are the methods to resolve collision? Explain linear probing with an example.	7	L2	CO5
	b.	Explain in detail, about static and dynamic hashing.	6	L2	CO5
	c.	Discuss Leftist Trees with an example.	7	L2	CO5
		OR			
Q.10	a.	Explain different types of HASH function with example.	6	L2	CO5
	b.	Discuss AVL tree with an example. Write a function for insertion into an AVL Tree.	6	L3	CO5
	c.	Define Red-black Tree, Splay tree. Discuss the method to insert an element into Red-Black tree.	8	L2	CO5

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CBCS SCHEME

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BCS306A

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Object Oriented Programming with Java

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Discuss the different data types supported by Java along with the default values and literals.	8	L2	CO1
	b.	Develop a Java program to convert Celsius temperature to Fahrenheit.	6	L3	CO2
	c.	Justify the statement "Compile once and run anywhere" in Java.	6	L2	CO1
		OR			
Q.2	a.	List the various operators supported by Java. Illustrate the working of >> and >>> operators with an example.	8	L2	CO1
	b.	Develop a Java program to add two matrices using command line argument.	10	L3	CO2
	c.	Explain the syntax of declaration of 2D arrays in Java.	2	L2	CO1
		Module – 2			
Q.3	a.	Examine Java Garbage collection mechanism by classifying the 3 generations of Java heap.	6	L2	CO1
	b.	Develop a Java program to find area of rectangle, area of circle and area of triangle using method overloading concept. Call these methods from main method with suitable inputs.	10	L3	CO2
	c.	Interpret the general form of a class with example.	4	L2	CO2
		OR			
Q.4	a.	Outline the following keywords with an example : (i) this (ii) static	6	L2	CO2
	b.	Develop a Java program to create a class called 'Employee' which contains 'name', 'designation', 'empid' and 'basic salary' as instance variables and read ( ) and write ( ) as methods. Using this class, read and write five employee information from main ( ) method.	10	L3	CO2
	c.	Interpret with an example, types of constructions.	4	L2	CO2
		Module – 3			
Q.5	a.	Illustrate the usage of super keyword in Java with suitable example. Also explain the dynamic method dispatch.	10	L2	CO3
	b.	Build a Java program to create an interface Resizable with method resize (int radius) that allow an object to be resized. Create a class circle that implements resizable interface and implements the resize method.	10	L3	CO3
		OR			
Q.6	a.	Compare and contrast method overloading and method overriding with suitable example.	8	L2	CO2

	b.	Define inheritance and list the different types of inheritance in Java.	4	L2	CO3
	c.	Build a Java program to create a class named 'Shape'. Create 3 sub classes namely circle, triangle and square ; each class has 2 methods named draw ( ) and erase ( ). Demonstrate polymorphism concepts by developing suitable methods and main program.	8	L3	CO3
		Module – 4			
Q.7	a.	Examine the various levels of access protections available for packages and their implications with suitable examples.	10	L2	CO4
	b.	Build a Java program for a banking application to throw an exception, where a person tries to withdraw the amount even though he/she has lesser than minimum balance (Create a custom exception)	10	L3	CO4
		OR			
Q.8	a.	Define Exception. Explain Exception handling mechanism provided in Java along with syntax and example.	10	L2	CO4
	b.	Build a Java program to create a package "balance" containing Account Class with displayBalance ( ) method and import this package in another program to access method of Account Class.	10	L3	CO4
		Module – 5			
Q.9	a.	Define a thread. Also discuss the different ways of creating a thread.	6	L2	CO5
	b.	How synchronization can be achieved between threads in Java? Explain with an example.	6	L2	CO5
	c.	Develop a Java program for automatic conversion of wrapper class type into corresponding primitive type that demonstrates unboxing.	8	L3	CO5
		OR			
Q.10	a.	Summarize the type wrappers supported in Java.	6	L2	CO5
	b.	Explain Autoboxing/Unboxing that occurs in expressions and operators.	6	L2	CO5
	c.	Develop a Java program to create a class myThread. Call the base class constructor in this class's constructor using super and start the thread. The run method of the class starts after this. It can be observed that both main thread and created child thread are executed concurrently.	8	L3	CO5

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CBCS SCHEME

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BCS302

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Digital Design and Computer Organization

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Reduce the following Boolean expressions to the minimum number of literals. i) $x(x' + y)$ ii) $x + x'y$ iii) $(x + y)(x + y')$ iv) $xy + x'z + yz$ v) $(x + y)(x' + z)(y + z)$	10	L3	CO1
	b.	Determine the minimum SOP form using Karnaugh Map $F = A'B'C' + B'CD' + A'BCD' + AB'C'$.	10	L3	CO1
		OR			
Q.2	a.	Simplify the Boolean function $F(w, x, y, z) = \Sigma(1, 3, 7, 11, 15)$ which has the don't care conditions $d(w, x, y, z) = \Sigma(0, 2, 5)$	10	L3	CO1
	b.	Simplify and implement the following Boolean function using NAND gates $F(x, y, z) = (1, 2, 3, 4, 5, 7)$.	10	L3	CO1
		Module – 2			
Q.3	a.	Implement the design of combinational circuit BCD and excess 3 code converter.	10	L2	CO2
	b.	Implement full adder circuit using 3:8 decoders.	10	L2	CO2
		OR			
Q.4	a.	With Truth table and K-map simplification, implement the full adder with basic gates and using two half adders an OR gate.	10	L2	CO2
	b.	Realize the Boolean function using 8:1 multiplexer $F(A, B, C, D) = \Sigma(1, 3, 4, 11, 12, 13, 14, 15)$.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain Bus structure with diagram, explain how different peripherals connected to the bus.	10	L2	CO3
	b.	Explain in detail about the word alignment of a machine (microprocessor based systems) what is the consecutive addresses of aligned words for 16, 32 and 64 bit word length of the machine? Give consecutive address for each of the following specified above.	10	L2	CO3
		OR			
Q.6	a.	Write a note on : i) Register Transfer Notation (RTN) ii) Assembly Language Notation.	10	L2	CO3

	b.	Illustrate an indexed addressing mode with a assembly language program to find the sum of the Test 1, Test 2 and Test 3 scores of the N number of students.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain Hardware interrupt, enabling/disabling of interrupts and sequence of events in handling interrupt request from a single device.	10	L2	CO4
	b.	Explain memory mapped I/O and I/O interface for an input device with a diagram.	10	L2	CO4
		OR			
Q.8	a.	Describe DMA with its register and controllers.	10	L2	CO4
	b.	Explain the effect of size, cost and speed in memory Hierarchy.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain the process of Fetching word from memory in processor.	10	L2	CO5
	b.	With a diagram, explain the single bus organization of the data path inside a processor.	10	L2	CO5
		OR			
Q.10	a.	Describe how an ALU perform on arithmetic and logic operation along with input gating diagrams.	10	L2	CO5
	b.	Explain the complete set of operations involved in executing the instruction Add (R_3) R^1 along with control sequence.	10	L2	CO5

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BCS303

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Operating Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain multi programming and time sharing systems.	07	L3	CO1
	b.	Explain the dual mode operation in operating systems with a neat block diagram.	07	L3	CO1
	c.	What are virtual machines? Explain with a neat figure.	06	L3	CO1
		OR			
Q.2	a.	What are system calls? Briefly explain different types of system calls.	07	L3	CO1
	b.	List and explain the services provided by OS for the user in efficient operation of a system.	07	L3	CO1
	c.	What are micro kernels? With a neat figure, explain the micro kernel structure? Point out their advantages over layered approach.	06	L3	CO1
		Module – 2			
Q.3	a.	What is process? Explain different states of the process with state transition diagram and process control block.	08	L2	CO2
	b.	What is Interprocess communication? Explain.	06	L2	CO2
	c.	What is thread? How it is different from process? Discuss various multithreading models with suitable illustration.	06	L2	CO2
		OR			
Q.4	a.	Consider the following processes where smaller the number has higher priority. Draw the Gantt chart compute the waiting time and average turnaround time by using FCFS, SRTF, preemptive priority scheduling.	12	L2	CO2
	b.	Discuss the benefits of multithreaded programming. Explain the threading issues in detail.	08	L2	CO2
		Module – 3			
Q.5	a.	What are the requirements that must be satisfied by a solution to the critical section problem? Illustrate with an example the Peterson's solution for critical section problem.	08	L3	CO3
	b.	What is critical section problem and solutions to the problem? How to solve using semaphores?	06	L3	CO3
	c.	Explain the classical bounded buffer problem of synchronization. Give the solution	06	L3	CO3
		OR			
Q.6	a.	What is dead lock? What are the necessary conditions for the deadlock to occur? How to recover from deadlocks.	10	L3	CO3

Processes	Arrival times	Burst time	Priority
P_1	0	7	4
P_2	3	5	2
P_3	3	3	6
P_4	5	5	3

	b.	Assume that there are 5 processes P_0 to P_4 and 4 types of resources. At time T_0 the system has following: Apply the bankers algorithm to answer following: (i) What is the content of need matrix? (ii) Is the system in a safe state? (iii) If the request from P_1(2, 1, 1, 0) arrives can it be granted?	10	L3	CO3

Processes	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	0	1	1	0	0	2	1	0	1	3	1	0
P_1	1	4	4	1	1	6	5	2				
P_2	1	3	6	5	2	3	6	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

Module – 4

Q.7	a.	What is paging? Differentiate between paging and segmentation.	06	L3	CO4
	b.	What are TLB? Explain TLB in detail with a simple paging system and neat diagram.	08	L3	CO4
	c.	Given the memory partitions of 100K, 500K, 200K, 300K and 600K, apply first fit, best fit and worst fit algorithms to place 212K, 417K, 112K and 426K.	06	L3	CO4
		OR			
Q.8	a.	What is page fault? With a neat diagram, explain the steps in handling page fault.	08	L3	CO4
	b.	Illustrate how demand paging affects system performance. What is thrashing how it can be controlled?	06	L3	CO4
	c.	Consider the following sequence: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 Assuming frame size of 4, apply LRU, FIFO and optimal algorithm to find the page faults. Find out which algorithm is most efficiency.	06	L3	CO4
		Module – 5			
Q.9	a.	Explain various file attributes and operations of files.	06	L3	CO5 CO6
	b.	With a neat diagram, explain two level and tree structured directory structure.	08	L3	CO5 CO6
	c.	What is file? Explain the file mounting.	06	L3	CO5 CO6
		OR			
Q.10	a.	Give the following sequence: 95, 180, 34, 119, 11, 123, 62, 64 with the head initially at 50 and ending at track 199. What is the total disk travelled by the disk drum to satisfy request using FCFS, SSTF, LOOK and CLOOK algorithms.	12	L3	CO5 CO6
	b.	Explain the access matrix model of implementing protection on OS.	08	L3	CO5 CO6

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CBCS SCHEME

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BCS306A

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Object Oriented Programming with Java

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Differentiate two paradigms of programming.	5	L2	CO1
	b.	Explain the various bitwise and short circuit operators in Java.	8	L2	CO1
	c.	Write a Java program with a method to check whether a given number is prime or not.	7	L3	CO1
		OR			
Q.2	a.	Explain various scopes of variables in Java.	5	L2	CO1
	b.	Explain the arithmetic compound assignment and Ternary operators in Java.	8	L2	CO1
	c.	Write a Java program to perform linear search on an array elements accepted from keyboard and key element also accepted from key board.	7	L3	CO1
		Module – 2			
Q.3	a.	Explain method overloading in Java with examples.	8	L2	CO2
	b.	Design a stack class to hold maximum of N numbers with a constructor, push, POP and Display methods. Develop Java main method to illustrate stack operations.	12	L3	CO2
		OR			
Q.4	a.	Explain the role of "this" keyword and "static" keyword in Java.	8	L2	CO2
	b.	Design a class called "Employee" with fields ID, Name and Salary. Write a suitable constructors a method to raise salary and a static method to display. The number of Employee objects. Write suitable Main method for illustration.	12	L3	CO2
		Module – 3			
Q.5	a.	Explain the role of "Super" with example Java program.	6	L2	CO3
	b.	For any class and any method as an example, explain method overriding.	5	L2	CO3
	c.	Develop a Java program to create class called "Shape". Create 3 sub classes : circle, triangle and square. Each class has 2 member function area ( ) and draw ( ). Demonstrate polymorphism with a suitable main program.	9	L3	CO3
		OR			
Q.6	a.	Explain the order of constructor execution in a multilevel class hierarchy.	6	L2	CO3
	b.	Define dynamic method dispatch and write a code snippet in Java to demonstrate.	5	L1	CO3

	c.	Develop Java program to create interface Resizable with methods resize width (int width) and resize height (int height) that allow object to be resized. Create a class Rectangle that implements This Interface.	9	L3	CO3
		Module – 4			
Q.7	a.	Explain four categories of visibility for class members based on packages.	6	L2	CO4
	b.	Give the general form of an exception handling block and write a Java program to illustrate multiple catch classes.	7	L2	CO4
	c.	Write a custom exception in Java called "less marks" and raise This exception when marks entered by valuator in the range [30 – 34]	7	L3	CO4
		OR			
Q.8	a.	With code snippets, explain mechanism to create and import a package in Java.	6	L2	CO4
	b.	Write a Java program to create chained exceptions with top-level exception is Null Pointer Exception and its cause Arithmetic Exception.	7	L3	CO4
	c.	Develop a Java program to create custom exception for Negative odd numbers.	7	L3	CO4
		Module – 5			
Q.9	a.	Explain various methods of thread class in Java.	6	L2	CO5
	b.	Write a Java program to create 4 threads and each thread when run, will sleep for 500 milliseconds and print its name before "Before Quitting".	8	L3	CO5
	c.	Explain the use of Type wrappers in Java with example.	6	L2	CO5
		OR			
Q.10	a.	Explain is Alive ( ) and join ( ) methods of Thread with example code snippet.	6	L2	CO5
	b.	Write a Java program to create 4 Rread and each Thread generates random number and prints it and sleeps for 800 msec and quits.	8	L3	CO5
	c.	Explain the concept of autoboxing /unboxing in expressions and methods.	6	L2	CO5

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BCS401

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Analysis and Design of Algorithms

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is an algorithm? Explain the fundamentals of algorithmic problem solving.	10	L2	CO1
	b.	Develop an algorithm to search an element in an array using sequential search. Calculate the best case, worst case and average case efficiency of this algorithm.	10	L3	CO1
		OR			
Q.2	a.	Explain asymptotic notations with example.	10	L2	CO1
	b.	Give the general plan for analyzing the efficiency of the recursive algorithm. Develop recursive algorithm for computing factorial of a positive number. Calculate the efficiency in terms of order of growth.	10	L3	CO1
		Module – 2			
Q.3	a.	Explain Strassen's matrix multiplication approach with example and derive its time complexity.	10	L3	CO2
	b.	What is divide and conquer? Develop the quick sort algorithm and write its best case. Make use of this algorithm to sort the list of characters: E, X, A, M, P, L, E.	10	L2	CO2
		OR			
Q.4	a.	Distinguish between decrease & conquer and divide & conquer algorithm design techniques with block diagram. Develop insertion sort algorithm to sort a list of integers and estimate the efficiency.	10	L3	CO2
	b.	Define topological sorting. List the two approaches of topological sorting and illustrate with examples.	10	L2	CO2
		Module – 3			
Q.5	a.	Define AVL tree with an example. Give worst case efficiency of operations on AVL tree. Construct an AVL tree of the list of keys: 5, 6, 8, 3, 2, 4, 7 indicating each step of key insertion and rotation.	10	L3	CO3
	b.	Define Heap. Explain the bottom-up heap construction algorithm. Apply heap sort to sort the list of numbers 2, 9, 7, 6, 5, 8 in ascending order using array representation.	10	L3	CO3
		OR			
Q.6	a.	Define 2-3 tree. Give the worst case efficiency of operations on 2-3 tree. Build 2-3 tree for the list of keys 9, 5, 8, 3, 2, 4, 7 by indicating each step of key insertion and node splits.	10	L3	CO3
	b.	Design Horspool algorithm for string matching. Apply this algorithm to find the pattern BARBER in the text: JIM_SAW_ME_IN_A_BARBERSHOP	10	L3	CO3
		Module – 4			
Q.7	a.	Apply Dijkstra's algorithm to find the single source shortest path for given graph [Fig.Q7(a)] by considering 's' as source vertex. Illustrate each step.	10	L3	CO4

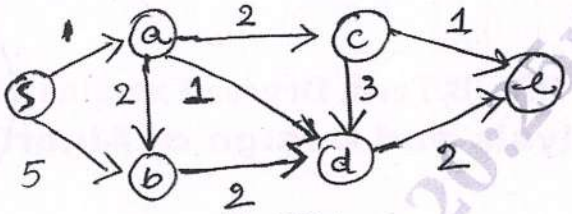

Fig.Q7(a)

	b.	Define transitive closure. Write Warshall's algorithm to compute transitive closure. Illustrate using the following directed graph.	10	L3	CO4

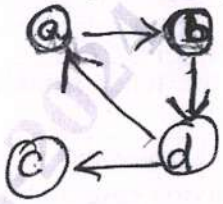

Fig.Q7(b)

OR

Q.8	a.	Define minimum spanning tree. Write Kruskal's algorithm to find minimum spanning tree. Illustrate with the following undirected graph.	10	L3	CO4

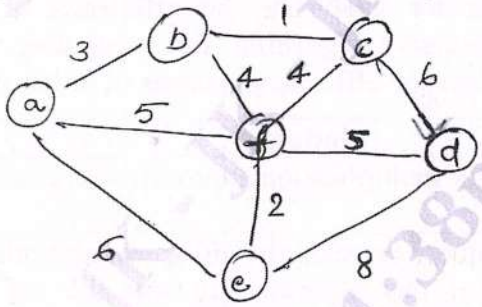

Fig.Q8(a)

	b.	Construct Huffman Tree and resulting code for the following: (i) Encode the text : ABACABAD (ii) Decode the text : 100010111001010	10	L3	CO4

Character	A	B	C	D	-
Probability	0.4	0.1	0.2	0.15	0.15

Module – 5

Q.9	a.	Explain n-Queen's problem with example using backtracking approach.	10	L2	CO5
	b.	Solve the following instance of the knapsack problem by the branch-and-bound algorithm. Construct state-space tree. The knapsack's capacity W is 10.	10	L3	CO5

Item	Weight	Value
1	4	$ 40
2	7	$ 42
3	5	$ 25
4	3	$ 12

OR

Q.10	a.	Differentiate between Branch and Bound technique and Backtracking. Apply backtracking to solve the following instance of subset-sum problem S = {3, 5, 6, 7} and d = 15. Construct a state space tree.	10	L3	CO5
	b.	Explain greedy approximation algorithm to solve discrete knapsack problem.	10	L2	CO5

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BCS402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Microcontrollers

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the architecture of an arm embedded device with a neat diagram.	10	L2	CO1
	b.	How are monitor and control internal operations performed in ARM core? Explain in brief.	10	L2	CO1
		OR			
Q.2	a.	Explain memory management in ARM core. Compare cache and tightly coupled memory.	10	L2	CO1
	b.	Explain mechanism applied by ARM core to handle exception, interrupts using different vector table.	10	L2	CO1
		Module – 2			
Q.3	a.	Examine data processing instructions requirement in the manipulation of data register? Explain in brief data processing instructions.	10	L2	CO2
	b.	Explain with examples the following 32-bit instruction of ARN processor i) CMN ii) MLA iii) MRS iv) BIC v) LDR.	10	L2	CO2
		OR			
Q.4	a.	Explain the following with example : i) Stock operation ii) Swap instructions.	10	L2	CO2
	b.	Explain Branch instructions in ARM with suitable example. Demonstrate Branch instruct usage flow of execution with an example program.	10	L2	CO2
		Module – 3			
Q.5	a.	How registers are allocated to optimize the program? Develop an assembly level program to find the sum of first to integer numbers.	10	L2	CO3
	b.	How complier handles a "for loop" with variable number of iterations N and loop controlling with an example.	10	L2	CO3
		OR			
Q.6	a.	Explain the following terms with an appropriate example : i) Pointer Aliasing ii) Portability issues.	10	L2	CO3
	b.	How function calling is efficiently used by ARM through APCS with an example program.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain ARM processors exception and modes with a neat diagram.	10	L2	CO4
	b.	Explain exception priorities and link register offset.	10	L2	CO4
		OR			
Q.8	a.	List ARM firmware suite features. Explain firmware execution flow and Red Hat Boot.	10	L2	CO4
	b.	Explain IRQ and Fir exception, also to enable and disable IRQ and FIQ interrupts.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain basic architecture of cache memory.	10	L2	CO5
	b.	Explain process involved in main memory mapping to a cache memory.	10	L2	CO5
		OR			
Q.10	a.	Explain with diagram set associative cache. How are efficiency is measured?	10	L2	CO5
	b.	Briefly explain cache line replacement policies with an example.	10	L2	CO5

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BCS403

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Database Management Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define database. Elaborate component modules of DBMS and their interactions.	10	L2	CO1
	b.	Describe the three-schema architecture. Why do we need mappings among schema levels?	06	L2	CO1
	c.	Explain the difference between logical and physical data independence.	04	L2	CO1
		OR			
Q.2	a.	Draw an ER diagram for an COMPANY database with employee, department, project as strong entities and dependent as weak entity. Specify the constraints, relationships and ratios in the ER diagram.	10	L3	CO3
	b.	Define the following terms with example for each using ER notations: Entity, attribute, composite attribute, multivalued attribute, participation role.	10	L3	CO3
		Module – 2			
Q.3	a.	Discuss the update operations and dealing with constraint violations with suitable examples.	08	L2	CO2
	b.	Illustrate the relational algebra operators with examples for select and project operation.	06	L2	CO2
	c.	Discuss the characteristics of relations that make them different from ordinary table and files.	06	L2	CO2
		OR			
Q.4	a.	Perform (i) Student U instructor (ii) Student ∩ Instructor (iii) Student – Instructor (iv) Instructor – Student on the following tables: Student Fname | Lname Susan | Yao Ramesh | Shah Johnny | Kohler Barbara | Jones Amy | Ford Jimmy | Wang Ernest | Gilbert Instructor Fname | Lname John | Smith Ricardo | Browne Susan | Mao Francis | Johnson Ramesh | Shah	04	L3	CO2
	b.	Consider the following relational database schema and write the queries in relational algebra expressions: EMP(Eno, Ename, Salary, Address, Phone, DNo) DEPT(DNo, Dname, DLoc, MgrEno) DEPENDENT(Eno, Dep_Name, Drelation, Dage) (i) List all the employees who reside in 'Belagavi'. (ii) List all the employees who earn salary between 30000 and 40000 (iii) List all the employees who work for the 'Sales' department (iv) List all the employees who have at least one daughter (v) List the department names along with the names of the managers	10	L3	CO2

	c.	Consider the two tables T_1 and T_2 shown below: T_1 P | Q | R 10 | a | 5 15 | b | 8 25 | a | 6 T_2 A | B | C 10 | b | 6 25 | c | 3 10 | b | 5 Show the results of the following operations: (i) $T_1 \times_{T_1.P=T_2.A} T_2$ (ii) $T_1 \times_{T_1.Q=T_2.B} T_2$ (iii) $T_1 \times_{(T_1.P=T_2.A \text{ AND } T_1.R=T_2.C)} T_2$	06	L3	CO2
		Module – 3			
Q.5	a.	Discuss the informal design guidelines for relation schema design.	08	L2	CO4
	b.	Define 1NF, 2NF, and 3NF with examples.	06	L2	CO4
	c.	Write the syntax for INSERT, UPDATE and DELETE statements in SQL and explain with suitable examples.	06	L2	CO3
		OR			
Q.6	a.	Discuss insertion, deletion and modification anomalies. Why are they considered bad? Illustrate with examples.	10	L2	CO3
	b.	Illustrate the following with suitable examples: (i) Datatypes in SQL (ii) Substring Pattern Matching in SQL.	10	L2	CO3
		Module – 4			
Q.7	a.	Consider the following relations: Student(Snum, Sname, Branch, level, age) Class(Cname, meet_at, room, fid) Enrolled(Snum, Cname) Faculty(fid, fname, deptid) Write the following queries in SQL. No duplicates should be printed in any of the answers. (i) Find the names of all Juniors (level = JR) who are enrolled in a class taught by I. Teach. (ii) Find the names of all classes that either meet in room R128 or have five or more students enrolled. (iii) For all levels except JR, print the level and rthe average age of students for that level. (iv) For each faculty member that has taught classes only in room R128, print the faculty member's name and the total number of classes she or he has taught. (v) Find the names of students not enrolled in any class.	10	L3	CO3
	b.	What do understand by correlated Nested Queries in SQL? Explain with suitable example.	04	L2	CO3
	c.	Discuss the ACID properties of a database transaction.	06	L2	CO4
		OR			
Q.8	a.	What are the views in SQL? Explain with examples.	04	L3	CO5
	b.	In SQL, write the usage of GROUP BY and HAVING clauses with suitable examples.	06	L2	CO3
	c.	Discuss the types of problems that may encounter with transactions that run concurrently.	10	L2	CO5

		Module – 5			
Q.9	a.	What is the two phase locking protocol? How does it Guarantee serializability.	06	L2	CO5
	b.	Describe the wait-die and wound-wait protocols for deadlock prevention.	08	L2	CO5
	c.	List and explain the four major categories of NOSQL system.	06	L2	CO3
		OR			
Q.10	a.	What is Multiple Granularity locking? How is it implemented using intension locks? Explain.	10	L2	CO5
	b.	Discuss the following MongoDB CRUD operations with their formats: (i) Insert (ii) Delete (iii) Read	06	L2	CO4
	c.	Briefly discuss about Neo4j data model.	04	L2	CO4

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BIS402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Advanced Java

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is collection Frame Work? Explain the methods defined by the following Interfaces: (i) Collection (ii) List (iii) Sorted Set (iv) Queue	10	L2	CO1
	b.	What are Legacy Classes? Explain any four legacy classes of Java's collection Frame work with suitable program.	10	L2	CO1
		OR			
Q.2	a.	Explain how collectors can be accessed using an iterator with example.	5	L3	CO1
	b.	What are the various changes that collection framework underwent recently?	5	L1	CO1
	c.	With an example program, explain how to store user-defined classes in collections.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain any two character extraction methods of string class.	5	L2	CO2
	b.	Explain the various string constructors used in Java with examples.	10	L2	CO2
	c.	Explain additional string methods.	5	L2	CO2
		OR			
Q.4	a.	Briefly describe special string operations with syntax and examples.	5	L2	CO2
	b.	Explain the following methods of string buffer class with examples : (i) capacity ( ) (ii) reverse ( ) (iii) insert (iv) append ( )	10	L2	CO2
	c.	Explain any four string modification methods of string class.	5	L2	CO2
		Module – 3			
Q.5	a.	Explain the four types of the swing buttons, with demonstration program.	10	L3	CO3
	b.	Explain MVC connector Architecture.	5	L2	CO3
	c.	What are the two key swing features? Discuss.	5	L1	CO3
		OR			
Q.6	a.	Explain the following : (i) JLabel and Image Icon. (ii) JTextField	10	L2	CO3
	b.	Write a program to demonstrate a simple swing application.	10	L3	CO3
		Module – 4			
Q.7	a.	Explain the life cycle of Servlets.	5	L2	CO4
	b.	Describe the core interfaces that are provided in Jakarta (Javax), Servlet, http package.	5	L2	CO4
	c.	Define JSP. Explain the different types of JSP tags by taking suitable example.	10	L2	CO4
		OR			

Q.8	**a.**	Explain any two cookies method.	**5**	**L1**	**CO4**
	b.	With a code, explain how to handle HTTP get requests and HTTP post requests.	**10**	**L2**	**CO4**
	c.	Explain how cookies can be handled using servlets.	**5**	**L4**	**CO4**
		Module – 5			
Q.9	**a.**	Explain different steps involved in JDBC process with a code snippet.	**10**	**L3**	**CO5**
	b.	List and elaborate Database Metadata Object methods.	**5**	**L2**	**CO5**
	c.	List and explain three kinds of exception occurred in JDBC.	**5**	**L2**	**CO5**
		OR			
Q.10	**a.**	Mention all steps to create the association between the database and a JDBC/ODBC bridge.	**12**	**L3**	**CO5**
	b.	Explain the four types of JDBC drivers.	**8**	**L2**	**CO5**

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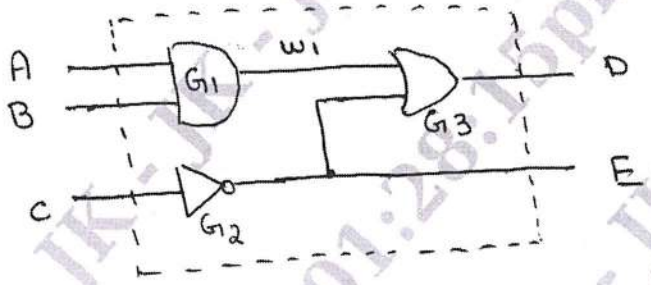
BCS302

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Digital Design and Computer Organization

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Determine the complement of the following function: (i) F = xy′+ x′y (ii) F = x′yz′ + x′y′z	06	L3	CO1
	b.	Describe map method for three variables.	04	L2	CO1
	c.	Apply K map technique to simplify the following function: (i) F(x, y, z) = Σ(0, 2, 4, 5, 6) (ii) F(x, y, z) = x′y + yz′ + y′z′	10	L3	CO1
		OR			
Q.2	a.	Apply K map technique to simplify the function : F(w, x, y, z) = Σ(1, 3, 7, 11, 15) and d(w, x, y, z) = Σ(0, 2, 5)	06	L3	CO1
	b.	Determine all the prime implicants for the Boolean function F and also determine which are essential F(w, x, y, z) = Σ(0, 2, 4, 5, 6, 7, 8, 10, 13, 15)	10	L3	CO1
	c.	Develop a verilog gate-level description of the circuit shown in Fig.Q2(c).  Fig.Q2(c)	04	L3	CO1
		Module – 2			
Q.3	a.	Explain the combinational circuit design procedure with code conversion example.	10	L2	CO2
	b.	Design a full adder circuit. Also develop data flow verilog model for full adder.	10	L3	CO2
		OR			
Q.4	a.	Describe 4 × 1 MUX with block diagram and truth table. Also develop a behavioral model verilog code for 4 × 1 MUX.	10	L2	CO2
	b.	What are storage elements? Explain the working of SR and D latch along with logic diagram and function table.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the basic operational concepts between the processor and memory.	10	L2	CO3
	b.	Describe the following: (i) Processor clock (ii) Basic performance equation (iii) Clock rate (iv) SPEC rating	10	L2	CO3
		OR			
Q.6	a.	Define addressing mode. Explain any four types of addressing mode with example.	10	L2	CO3

	b.	Mention four types of operations to be performed by instructions in a computer. Explain the basic types of instruction formats to carry out. $C \leftarrow [A] + [B]$	10	L2	CO3
Module – 4					
Q.7	a.	With a neat diagram, explain the concept of accessing I/O devices.	10	L2	CO4
	b.	What is bus arbitration? Explain centralized and distributed arbitration method with a neat diagram.	10	L2	CO4
OR					
Q.8	a.	With neat sketches, explain various methods for handling multiple interrupts requests raised by multiple devices.	10	L2	CO4
	b.	What is cache memory? Explain any two mapping function of cache memory.	10	L2	CO4
Module – 5					
Q.9	a.	Draw the single bus architecture and write the control sequence for execution of instruction ADD (R_3), R_1.	10	L3	CO5
	b.	With suitable diagram, explain the concept of register transfer and fetching of word from memory.	10	L2	CO5
OR					
Q.10	a.	With a neat diagram, explain the flow of 4-stage pipeline operation.	10	L2	CO5
	b.	Explain the role of cache memory and pipeline performance.	10	L2	CO5

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BCS303

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Operating Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Operating System. Explain dual mode of operating systems with a neat diagram.	06	L1 L2	CO1
	b.	Distinguish between the following terms: i) Multiprogramming and Multitasking ii) Multiprocessor and Clustered system	06	L2	CO1
	c.	Explain with a neat diagram VM-WARE Architecture.	08	L1 L2	CO1
		OR			
Q.2	a.	List and explain the services provided by OS for the user and efficient operation of system.	06	L2	CO1
	b.	Explain the different computing equipments.	06	L2	CO1
	c.	What are systems calls? List and explain the different types of systems calls.	08	L1 L2	CO1
		Module – 2			
Q.3	a.	What is process? Explain process state diagram and process control block with a neat diagram.	10	L1 L2	CO2
	b.	What is interprocess communication? Explain direct and indirect communication with respect to message passing system.	10	L1 L2	CO2
		OR			
Q.4	a.	List and explain the different types of multithreading models.	06	L1 L2	CO2
	b.	Calculate the average waiting time and average turnaround time by drawing the Gantt-chart using FCFS, SJF, RR (Q = 4ms) and priority scheduling (Higher Number is having highest priority).	14	L3	CO2
		Module – 3			
Q.5	a.	What is critical section? Give the Peterson's solution to 2 processes critical section problem.	05	L1 L2	CO3
	b.	Explain Reader's and Writer's problem in detail.	07	L2	CO3
	c.	What is semaphore? Discuss the solution to the classical dinning philosopher problem.	08	L1 L2	CO3

Process	B.T. (ms)	Priority
P_1	24	1
P_2	03	2
P_3	03	3

		OR			
Q.6	**a.**	What is a Deadlock? What are the necessary conditions for the deadlock to occur?	**06**	**L1 L2**	**CO3**
	b.	Consider the following snap shot of the system. Process | Allocation (A B C) | Max (A B C) | Available (A B C) P_0 0 1 0 | 7 5 3 | 3 3 2 P_1 2 0 0 | 3 2 2 P_2 3 0 2 | 9 0 2 P_3 2 1 1 | 2 2 2 P_4 0 0 2 | 4 3 3 Answer the following questions: i) What is the content of the matrix need? ii) Is the system on a safe state? If so, find safe sequence. iii) If P_1 requirements for (1, 0, 2) additional resources can P_1 be granted.	**14**	**L3**	**CO2**
		Module – 4			
Q.7	**a.**	What is paging? Explain with a neat diagram paging hardware with TLB.	**10**	**L1 L2**	**CO4**
	b.	Explain the different strategies used to select a free hole from available holes.	**05**	**L1**	**CO4**
	c.	What is Fragmentation? List and explain its types.	**05**	**L2**	**CO4**
		OR			
Q.8	**a.**	What is page fault? With a neat diagram explain steps in handling page fault.	**08**	**L2**	**CO4**
	b.	Consider the page reference string for a memory with 3 frames determine the number of page faults using FIFO, optimal and LRU replacement algorithms. Which algorithms is more efficient? 7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1	**12**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Define File. List and explain different file operations and file attributes.	**10**	**L1**	**CO5**
	b.	Explain the different file allocation methods.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	What is Access Matrix? Explain the implementation of Access Matrix.	**10**	**L2**	**CO5**
	b.	A drive has 5000 cylinders numbered 0 to 4999. The drive is currently servicing at a request 143 and previously served a request at 125. The queue of pending request in FIFO order. 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 starting from current head position. What is the total distance travelled (in cylinders) by a disk arm to satisfy the request using FCFS, SSTF, SCAN, LOOK and C-Look algorithm	**10**	**L3**	**CO5**

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CBCS SCHEME

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BCS304

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Data Structures and Applications

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Data Structures. Explain the classification of data structures with a neat diagram.	8	L2	CO1
	b.	Write a C Functions to implement pop , push and display operations for stacks using assays.	7	L2	CO2
	c.	Differentiate structures and unions.	5	L2	CO1
		OR			
Q.2	a.	Write an algorithm to evaluate a postfix expression and apply the same for the given postfix expression. 6 2 / 3 – 4 2 * +.	7	L3	CO2
	b.	Explain the dynamic memory allocation function in detail.	8	L2	CO1
	c.	What is Sparse matrix? Give the triplet form of a given matrix and find its transpose $A = \begin{bmatrix} 0 & 0 & 3 & 0 & 4 \\ 0 & 0 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 6 & 0 & 0 \end{bmatrix}$	5	L3	CO1
		Module – 2			
Q.3	a.	Define Queue. Discuss how to represent a queue using dynamic assays.	8	L2	CO2
	b.	Write a C Function to implement insertion ( ) , deletion ( ) and display ( ) operations on circular queue.	6	L3	CO2
	c.	Write a note on Multiple stacks and queues with suitable diagram.	6	L2	CO2
		OR			
Q.4	a.	What is a linked list? Explain the different types of linked list with neat diagram.	6	L2	CO3
	b.	Write a C function for the following on singly linked list with example : i) Insert a node of the beginning ii) Delete a node at the front iii) Display.	8	L3	CO3
	c.	Write the C function to add two polynomials.	6	L2	CO3

		Module – 3			
Q.5	**a.**	Discuss how binary trees are represented using : i) Assay ii) Linked list.	**6**	**L2**	**CO4**
	b.	Define Threaded binary tree. Discuss In – threaded binary tree.	**6**	**L2**	**CO4**
	c.	Write the C function for the following additional list operation : i) Inverting Singly linked list ii) Concatenating Singly linked list.	**8**	**L3**	**CO3**
		OR			
Q.6	**a.**	Discuss Inorder , Preorder , Postorder and Level order traversal with suitable function for each.	**8**	**L3**	**CO4**
	b.	Define the threaded binary tree. Construct threaded binary tree for the following element : A, B, C, D, E, F, G, H, I.	**6**	**L2**	**CO4**
	c.	Write a C function for the following : i) Insert a node at the beginning of doubly linked list. ii) Deleting a node at the end of the doubly linked list.	**6**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Define Forest , Transform the forest into a binary tree and traverse using inorder , preorder and postorder traversal with an example.	**8**	**L1**	**CO5**
	b.	Define Binary search tree. Construct a binary search tree for the following elements : 100 , 85 , 45 , 55 , 120 , 20 , 70 , 90 , 115 , 65 , 130 , 145.	**6**	**L2**	**CO5**
	c.	Discuss Selection tree with an example.	**6**	**L2**	**CO5**
		OR			
Q.8	**a.**	Define Graph. Explain adjacency matrix and adjacency list representation with an example.	**8**	**L2**	**CO5**
	b.	Define the following terminology with example : i) Digraph ii) Weighted graph iii) Self loop iv) Connected graph.	**6**	**L2**	**CO5**
	c.	Briefly explain about Elementary graph operations.	**6**	**L3**	**CO5**
		Module – 5			
Q.9	**a.**	Explain in detail about Static and Dynamic Hashing.	**6**	**L2**	**CO5**
	b.	What is Collision? What are the methods to resolve collision?	**7**	**L2**	**CO5**
	c.	Explain Priority queue with the help of an examples.	**7**	**L2**	**CO5**
		OR			
Q.10	**a.**	Define Hashing. Explain different hashing functions with suitable examples.	**12**	**L2**	**CO5**
	b.	Write short note on : i) Leftist trees ii) Optimal binary search tree.	**8**	**L3**	**CO5**

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BCS306A

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Object Oriented Programming with JAVA

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	List and explain any three features of object oriented programming.	6	L1	CO1
	b.	What do you mean by type conversion and type casting? Give examples.	8	L2	CO1
	c.	How to declare and initialize 1-D and 2-D arrays in Java. Give examples.	6	L2	CO1
		OR			
Q.2	a.	List the short circuit operators and show the concept using few examples.	4	L2	CO1
	b.	With a java program, illustrate the use of ternary operator to find the greatest of three numbers.	6	L3	CO1
	c.	Develop a Java program to demonstrate the working of for each version of for loop. Initialize the 2D array with values and print them using for each.	10	L2	CO1
		Module – 2			
Q.3	a.	Develop a program in Java to implement a stack of integers.	12	L3	CO2
	b.	What are constructors? Give the types and explain the properties of constructors. Support with appropriate examples.	8	L2	CO2
		OR			
Q.4	a.	Illustrate with an example program to pass objects as arguments.	10	L2	CO2
	b.	Explain different access specifies in Java with example program.	10	L2	CO2
		Module – 3			
Q.5	a.	Define inheritance. List and explain different types of inheritance in Java with code snippets.	10	L2	CO3
	b.	Compare and contrast between overloading and overriding in Java with example program for each.	10	L2	CO3
		OR			
Q.6	a.	Analyze an interface in Java and list out the speed of an interface. Illustrate with the help of a program the importance of an interface.	10	L2	CO3
	b.	List the different uses of final and demonstrate each with the of code snippets.	10	L2	CO3

		Module – 4			
Q.7	**a.**	Define a package. Explain how to create user defined package with example.	**7**	**L2**	**CO4**
	b.	Discuss about exception handling in Java. Give the framework of the exception handling block. List the types of exception.	**8**	**L2**	**CO4**
	c.	Develop a Java program to raise a custom exception for division by zero using try, catch, throw and finally.	**5**	**L3**	**CO4**
		OR			
Q.8	**a.**	Compare throw and throws keyword by providing suitable example program.	**10**	**L2**	**CO4**
	b.	Explain about the need for finally block.	**5**	**L2**	**CO4**
	c.	Discuss about chained exceptions.	**5**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Define thread. Demonstrate creation of multiple threads with a program.	**10**	**L2**	**CO5**
	b.	Explain the two ways in which Java threads can be instantiated. Support your explanation with a sample program.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	What is enumeration? Explain the methods values( ) and valueof( ).	**10**	**L2**	**CO5**
	b.	Explain about type wrappers and auto boxing.	**10**	**L2**	**CO5**

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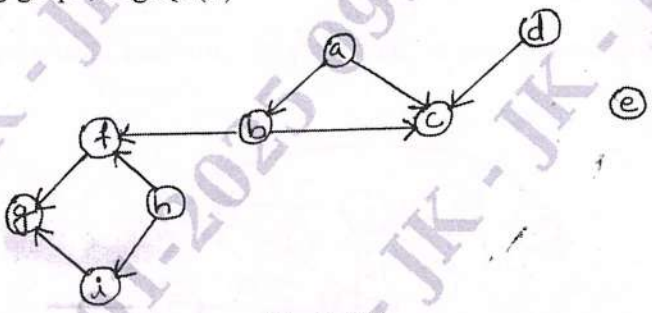
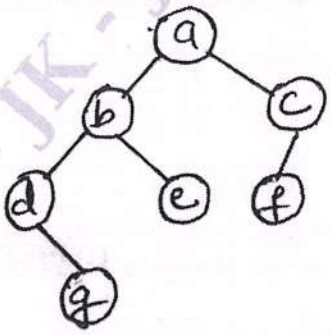
BCS401

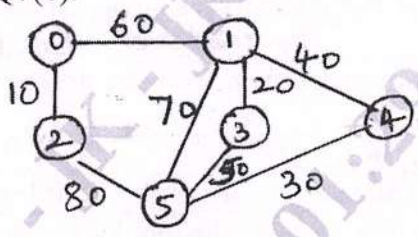
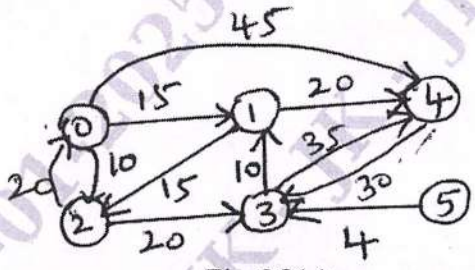
Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Analysis and Design of Algorithms

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the various steps in algorithm design and analysis process with the flow diagram.	08	L1	CO1
	b.	Give formal and informal definitions of asymptotic notations.	06	L1	CO1
	c.	Explain the general plan of mathematical analysis of recursive algorithm with an example.	06	L1	CO1
		OR			
Q.2	a.	Design algorithm for tower of Hanoi problem and obtain time complexity.	10	L1	CO1
	b.	Write an algorithm to search an element in an array using sequential search. Discuss the best case, worst case and average case efficiency of this algorithm.	10	L1	CO1
		Module – 2			
Q.3	a.	Write an algorithm to sort the numbers using insertion sort. Discuss its efficiency.	10	L2	CO2
	b.	Design quick sort algorithm and obtain its best, average and worst case efficiency.	10	L2	CO2
		OR			
Q.4	a.	Write merge sort algorithm and sort the list E X A M P L E.	08	L2	CO2
	b.	Apply the DFS based algorithm to solve the topological sorting problem for the following graph, Fig.Q4(b)  Fig.Q4(b)	06	L3	CO2
	c.	Write algorithm for pre-order, post order and in order traversals of a tree. Write pre-order, in-order and post order for the given tree.  Fig.Q4(c)	06	L2	CO2

Module – 3

Q.5	**a.**	Define AVL tree. Construct AVL tree for the list 5, 6, 8, 3, 2, 4, 7.	**10**	**L3**	**CO3**
	b.	Define heap. Sort the following lists by heapsort: H E A P S O R T (in alphabetical order)	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	Write the algorithm for comparison counting sort. Discuss its efficiency.	**10**	**L2**	**CO4**
	b.	Design Horspools algorithm for string matching. Apply Horspools algorithm to find the pattern BARBER on the text JIM_SAW_ME_IN_BARBERSHOP	**10**	**L3**	**CO4**
		Module – 4			
Q.7	**a.**	Write Warshall's algorithm and apply the same to compute transitive closure of a directed graph. $\begin{array}{c} \\ a \\ b \\ c \\ d \\ e \end{array}\begin{array}{c} \begin{array}{ccccc} a & b & c & d & e \end{array} \\ \begin{bmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{bmatrix} \end{array}$	**10**	**L3**	**CO3**
	b.	Construct minimum cost spanning tree using Kruskal's algorithm for the following graph, Fig.Q7(b).  Fig.Q7(b)	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Solve the following single source shortest path problem assuming vertex '5' as the source.  Fig.Q8(a)	**10**	**L3**	**CO4**
	b.	Write Huffman's algorithm. Construct Huffman tree and resulting code word for the following: Encode the text DAD_CBE.	**10**	**L4**	**CO4**

Character	A	B	C	D	E	-
Probability	0.5	0.35	0.5	0.1	0.4	0.2

Module – 5

Q.9	**a.**	Explain the following with example: (i) P problem (ii) NP problem	**06**	**L1**	**CO5**
	b.	What is decision tree? Construct decision tree for the three element insertion sort.	**08**	**L2**	**CO5**
	c.	Construct state space tree to solve 4 queens problem.	**06**	**L3**	**CO5**

OR

Q.No		Question	Marks	Level	CO
Q.10	a.	What is backtracking? Apply back tracking to solve the below instance of sum of subset problem: s = {3, 5, 6, 7}, d = 15	10	L3	CO6
	b.	Solve the following instance of knapsack problem using branch and bound technique knapsack capacity = 10.	10	L4	CO6

Item	Weight	Value
1	4	40
2	7	42
3	5	25
4	3	12

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CBCS SCHEME

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BCS402

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Microcontroller

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the purpose of various fields of current program status register with a neat diagram.	05	L2	CO1
	b.	Explain the ARM design philosophy.	06	L2	CO1
	c.	Explain the core extensions of ARM processor with neat block diagram.	09	L2	CO1
		OR			
Q.2	a.	Explain Embedded systems hardware with a neat block diagram.	06	L2	CO1
	b.	What is pipelines in ARM? Illustrate with an example the pipeline stage of ARM 9 and ARM 10.	09	L2	CO1
	c.	Describe the RISC design philosophy with 4 design rules.	05	L2	CO1
		Module – 2			
Q.3	a.	Explain the following with examples : (i) RSC (ii) MLA (iii) STRH (iv) SWP	10	L2	CO2
	b.	Explain the different data processing instruction in ARM.	10	L2	CO2
		OR			
Q.4	a.	Explain Barrel shifter instruction in ARM with suitable examples.	10	L2	CO2
	b.	Explain the different branch instruction of ARM processor.	05	L2	CO2
	c.	Explain co-processor instruction of ARM processor.	05	L2	CO2
		Module – 3			
Q.5	a.	Explain the different basic data types in C. Provide examples of how each data type can be used in a C program.	08	L2	CO3
	b.	Discuss the concept of register allocation in compiler optimization. Illustrate its significance with an example.	07	L2	CO3
	c.	Describe the process of a function call in C.	05	L2	CO3
		OR			
Q.6	a.	Discuss the common portability issues faced when writing C programs. How can these issues be mitigated.	07	L2	CO3
	b.	Explain the concept of pointer aliasing with example.	07	L2	CO3
	c.	How are function calls handled efficiently in calling function in C?	06	L2	CO3
		Module – 4			
Q.7	a.	What are interrupts? Discuss interrupt vector table with diagram for ARM processor.	06	L2	CO4
	b.	Describe the sequence of operations that occurs when an ARM processor handles an IRQ exceptions.	06	L2	CO4
	c.	Discuss the priority system for exception in ARM processor.	08	L2	CO4
		OR			
Q.8	a.	Explain the role of the link register in ARM exception handling.	08	L2	CO4
	b.	Explain the design and implementation of an interrupt stack in a ARM-based system. Explain the steps involved.	08	L2	CO4
	c.	What are the key differences between a boot loader and firmware?	04	L2	CO4

		Module – 5			
Q.9	a.	Explain the basic operation of a cache controller.	06	L2	CO5
	b.	With a neat diagram, explain the basic architecture of a cache memory.	10	L2	CO5
	c.	Mention any 4 relationship between cache and main memory.	04	L2	CO5
		OR			
Q.10	a.	Write a note on cache write policy both write back or write through.	10	L2	CO5
	b.	Describe the allocation policy on a cache miss.	04	L2	CO5
	c.	Write a note on following : (i) Write buffers (ii) Cache efficiency	06	L2	CO5

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BCS403

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Database Management System

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define the following terms: (i) Database (ii) Schema (iii) Entity (iv) DDL (v) Degree of a relationship	05	L1	CO1
	b.	Briefly explain characteristics of database approach.	05	L2	CO1
	c.	List and explain advantages of using DBMS approach.	10	L2	CO1
		OR			
Q.2	a.	Define the following terms: (i) Cardinality (ii) Weak entity (iii) Program data independence (iv) DML (v) Value sets	05	L1	CO1
	b.	Describe three-schema architecture. Why do we need mappings between schema levels?	05	L2	CO1
	c.	Explain different types of attributes in ER model with suitable example for each.	10	L2	CO1
		Module – 2			
Q.3	a.	With suitable example, explain the entity integrity and referential integrity constraints. Why each is considered important?	05	L2	CO2
	b.	Discuss equijoin and natural join with suitable example using relational algebra notation.	05	L2	CO2
	c.	Given the relational tables: Employee: EID | Name | DepID | Salary 1 | Alice | 10 | 5000 2 | Bob | 20 | 6000 3 | Eve | 20 | 6500 Department: DeptID | DeptName 10 | HR 20 | IT 30 | Sales Project PID | Project Name | DeptID 101 | Project Alpha | 10 102 | Project Beta | 20 103 | Project Gamma | 30 Write relational algebra expression for the following: (i) Find the names and salaries of all employees in the 'IT' department. (ii) Find the ID's and names of employees who are in the 'IT' department and have a salary greater than 6000. (iii) Find the ID's and names of employees who are either in the 'HR' department or have a salary greater than 6000. (iv) Find the names of employees who are not in the 'IT' department (v) Find the names of employees along with their department names.	10	L3	CO2

OR

Q.4	**a.**	Explain any two operations that change the state of relation in a database. Provide suitable examples.	**05**	**L2**	**CO2**
	b.	Discuss the aggregation functions and grouping in relational algebra with suitable examples.	**05**	**L2**	**CO2**
	c.	Given the relational tables: Student: SID | Name a | Alice b | Bob c | Carol Project: PID | Project Name p | Alpha q | Beta r | Gamma Language: LID | Language Name x | Python y | Java z | C++ Enrollment: SID | PID a | p a | q b | q c | r Write relational algebra expression for the following: (i) Rename the student table to Learner and display it. (ii) Find the students (learners) who are not enrolled in any project. (iii) Find the students who are enrolled in all projects. (iv) Find the students who are not enrolled in any project. (v) Find the students who are enrolled in both the 'Alpha' and 'Beta' projects.	**10**	**L3**	**CO2**

Module – 3

Q.5	**a.**	Explain Armstrong inference rules.	**05**	**L2**	**CO4**
	b.	What is the need for normalization? Explain 1NF, 2NF and 3NF with examples.	**05**	**L2**	**CO4**
	c.	What is functional dependency? Write an algorithm to find minimal cover for set of functional dependencies. Construct minimal cover M for set of functional dependencies which are: E = {B → A, D → A, AB → D}	**10**	**L3**	**CO4**

OR

Q.6	**a.**	Explain the types of update anomalies in SQL with an example.	**05**	**L2**	**CO4**
	b.	Explain types of JBBC drivers.	**05**	**L2**	**CO5**
	c.	Consider the schema R = ABCD, subjected to FDs F = {A →B, B →C}, and the non-binary partition D1 = {ACD, AB, BC}. State whether D1 is a lossless decomposition? [give all steps in detail].	**10**	**L3**	**CO4**

Module – 4

Q.7	**a.**	Define transaction. Discuss ACID properties.	**05**	**L2**	**CO5**
	b.	With a neat diagram, explain transition diagram of a transaction.	**05**	**L2**	**CO5**
	c.	Demonstrate working of assertion and triggers in SQL with example.	**10**	**L3**	**CO5**

OR

Q.8	**a.**	Explain cursor and its properties in embedded SQL with suitable example.	**05**	**L2**	**CO5**
	b.	Determine if the following schedule is serializable and explain your reasoning: i) T1 : R(X)W(X) T2 : R(X)W(X) T1 : COMMIT T2 : COMMIT ii) T1 : W(X)R(Y) T2 : R(X)W(Y) T1 : COMMIT T2 : COMMIT	**05**	**L2**	**CO5**

	c.	Consider the tables below: Sailors (sid : integer, sname : string, rating : integer, age : real) Boats (bid : integer, bname : string, color : string); Reserves (sid : integer, bid : integer, day : date) Write SQL queries for the following: (i) Write create table statement for reserves. (ii) Find all information of sailors who have reserved boat number 101. (iii) Find the names of sailors who have reserved at least one boat. (iv) Find the names of sailors who have reserved a red boat. (v) Find the average age of sailors for each rating level.	10	L3	CO5
		Module – 5			
Q.9	a.	Explain the CAP theorem.	05	L2	CO6
	b.	What is NOSQL graph database? Explain Neo4j.	05	L2	CO6
	c.	Why concurrency control and recovery are needed in DBMS? Demonstrate with suitable examples types of problems that may occur when two simple transactions run concurrently.	10	L3	CO5
		OR			
Q.10	a.	Explain basic operations CRUD in MongoDB.	05	L2	CO6
	b.	Explain deadlock prevention protocols.	05	L2	CO5
	c.	Briefly discuss the two-phase looking techniques f_0 concurrency control.	10	L3	CO5

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BCS501

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Software Engineering and Project Management

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain software process and software engineering practices.	10	L2	CO1
	b.	Explain the waterfall model and incremental model, with diagram.	10	L2	CO1
		OR			
Q.2	a.	Explain Boehm Spiral process model with a neat diagram. Mention its advantages and disadvantages.	10	L2	CO1
	b.	Explain the five activities of a generic process framework for software engineering.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the distinct tasks of requirement engineering.	10	L2	CO2
	b.	Illustrate the UML use case diagram for safe home system.	10	L2	CO2
		OR			
Q.4	a.	Explain Class-Responsibility-Collaborator(CRC) modeling and data modeling with an example.	10	L2	CO2
	b.	Explain the elements of analysis model in requirement modeling.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the principles of agile process development.	10	L2	CO3
	b.	Explain the following : i) Adaptive software development ii) SCRUM	10	L2	CO3
		OR			
Q.6	a.	Explain the concepts of extremes programming with a neat diagram.	10	L2	CO3
	b.	Explain design modeling principles that guide the respective framework activity.	10	L2	CO3
		Module – 4			
Q.7	a.	Illustrate the project management life cycle with a neat diagram.	10	L2	CO4
	b.	Explain : i) Different ways of categorizing software projects ii) Smart objectives	10	L2	CO4
		OR			
Q.8	a.	Explain the difference between traditional versus modern project management practices along with the role of management.	10	L3	CO4
	b.	Explain software development life cycle (ISO 12207) with a neat diagram.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain Quality Management System with principles of BS EN ISO-9001-2000.	10	L2	CO5
	b.	Explain the following : i) McCall model ii) Garvin's Quality Dimensions.	10	L2	CO5
		OR			
Q.10	a.	Describe six generic functions allowed in automated estimation techniques of software projects.	10	L3	CO5
	b.	Explain COCOMO II model.	10	L2	CO5

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CBCS SCHEME

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BCS502

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Computer Networks

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is data communication? List and explain characteristics and components of communication model.	06	L1	CO1
	b.	Define switching. Explain Circuit Switched Network and Packet Switched Network.	06	L2	CO1
	c.	With neat sketch, explain different layers of TCP/IP protocol suite.	08	L2	CO1
		OR			
Q.2	a.	What are guided transmission media? Explain twisted pair cable in detail.	06	L1	CO1
	b.	What is Virtual Circuit Network (VCN)? With neat diagram, explain three phases involved in VCN.	08	L1	CO1
	c.	Write a note on Encapsulation and decapsulation at Source Host for TCP/IP protocol suite.	06	L2	CO1
		Module – 2			
Q.3	a.	Define Redundancy. Explain CRC encoder and CRC decoder operation with block diagram.	08	L2	CO2
	b.	Distinguish between Flow Control and Error Control. Explain Stop and Wait Protocol.	08	L2	CO2
	c.	List and explain Control Fields of I-frames, S-frames and U-frames.	04	L2	CO2
		OR			
Q.4	a.	What is Hamming distance? With example, explain Parity Check Code.	06	L1	CO2
	b.	Define Framing. Explain character oriented framing and bit-oriented framing.	06	L1	CO2
	c.	With flow diagram, explain CSMA/CA.	08	L2	CO2
		Module – 3			
Q.5	a.	Explain virtual-circuit approach to route the packets in packet-switched network.	10	L2	CO3
	b.	Illustrate the working of OSPF and BGP.	10	L3	CO3
		OR			
Q.6	a.	Explain IPv6 datagram format.	10	L2	CO3
	b.	Write an Dijikstra's algorithm to compute shortest path through graph.	06	L1	CO3
	c.	Write a note on Routing Information Protocol (RIP) algorithm.	04	L2	CO3
		Module – 4			
Q.7	a.	Explain Go-Back-N protocol working.	10	L2	CO4
	b.	With neat sketch, explain three-way handshaking of TCP connection establishment.	10	L2	CO4

		OR			
Q.8	**a.**	With an outline, explain selective repeat protocol.	**10**	**L2**	**CO4**
	b.	List and explain various services provided by User Datagram Protocol (UDP).	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Briefly explain Secure Shell (SSH).	**10**	**L2**	**CO4**
	b.	Write a note on Request message and response message formats of HTTP.	**10**	**L2**	**CO4**
		OR			
Q.10	**a.**	With neat diagram, explain the basic model of FTP.	**04**	**L2**	**CO4**
	b.	Describe the architecture of electronic mail (e-mail).	**06**	**L3**	**CO4**
	c.	Briefly explain Recursive Resolution and Iterative Resolution in DNS.	**10**	**L2**	**CO4**

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CBCS SCHEME

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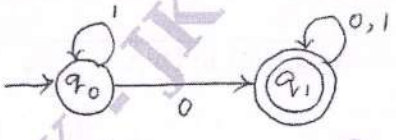
BCS503

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Theory of Computation

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define the following with example : i) Language ii) String iii) Power of an alphabet.	3	L1	CO1
	b.	Define DFA. Draw a DFA to accepts. i) The set of all strings that contain a substring aba. ii) To accept the stings of a's and b's that contain not more than there b's. iii) L = {w ∈{a, b}* : No 2 consecutive characters are same in w}.	10	L3	CO1
	c.	Convert the following NFA to DFA. → p {p, q} {p} q {r} {r} r {s} ϕ * s {s} {s}	7	L2	CO1
		OR			
Q.2	a.	Define the following with example : i) Alphabet ii) Reversal of string iii) Concatenation of Languages.	3	L1	CO1
	b.	Design a DFA for the Language : L = {w ∈ {0, 1}* : w is a string divisible by 5}.	7	L3	CO1
	c.	Define NFA. Obtain an ε - NFA which accepts strings consisting of 0 or more a's , followed by 0 or more b's followed by 0 or more C's. Also convert it to DFA.	10	L2	CO1
		Module – 2			
Q.3	a.	Define Regular expression. Write the regular expression for the following languages : i) Strings of a's and b's starting with a and ending with b. ii) Set of strings that consists of alternating 0's and 1's. iii) L = {a^n bm , (n + m) is even}. iv) L = {w : / w / mod 3 = 0 , where w ∈{a, b}*}.	10	L2	CO2

	b.	Minimize the following finite automata using Table filling algorithm : δ | a | b → A | B | A B | A | C C | D | B * D | D | A E | D | F F | G | E G | F | G H | G | D	10	L2	CO2
		OR			
Q.4	a.	Construct ε - NFA for the following Regular expression : i) $(0+1)\,0\,1(1+0)$ ii) $1(0+1)^*\,0$ iii) $(0+1)^*\,0\,1\,1^*$	6	L1	CO2
	b.	Obtain the Regular expression that denotes the language accepted by Fig. Q4(b). Fig. Q4(b)  Using Kleene's theorem.	6	L3	CO2
	c.	State the Pumping Lemma for the Regular Languages. And also prove that the following languages are note regular. i) $L = \{0^n\,1^m \mid n \le m\}$ ii) $L = \{0^n\,1^m\,2^n \mid n, m \ge 1\}$.	8	L1	CO2
		Module – 3			
Q.5	a.	Design CFG for the following languages : i) $L = \{a^n\,b^{n+3}, n \ge 0\}$ ii) $L = \{a^i\,b^j\,c^k, j = i+k, i \ge 0, k \ge 0\}$ iii) $L = \{w / /w/ \bmod 3 > 0 \text{ where } w \in \{a\}^*\}$ iv) $L = \{a^m\,b^n / m \ne n\}$ v) Palinderomes over 0 and 1.	10	L3	CO3
	b.	Consider the grammar G with productions. $S \rightarrow A\,b\,B / A / B$; $A \rightarrow aA / \varepsilon$; $B \rightarrow a\,B / b\,B / \varepsilon$. Obtain LMD , RMD and parse tree for the string aaabab. Is the given grammar ambiguous?	10	L2	CO3
		OR			
Q.6	a.	Define the following with example : i) Context free grammar ii) Left most Derivation iii) Parse tree iv) Ambiguous grammar.	4	L1	CO3
	b.	Design PDA for the language : $L = \{a^i\,b^j\,c^k / i + k = j, i \ge 0, k \ge 0\}$ and show the moves made by the PDA for the string aabbbc.	10	L3	CO3

	c.	Convert the following CFG's to PDA : $S \rightarrow a\,A$; $A \rightarrow a\,ABC / bB / a$; $B \rightarrow b$; $C \rightarrow c$.	6	L2	CO3
		Module – 4			
Q.7	a.	Define CNF. Convert the following CFG to CNF $E \rightarrow E + T / T$ $T \rightarrow T * F / F$ $F \rightarrow (E) / I$ $I \rightarrow Ia / Ib / a / b$.	10	L2	CO4
	b.	Show that $L = \{0^n\,1^n\,2n / n \geq 1\}$ is no context free.	4	L2	CO4
	c.	Prove that the family of context free languages is closed under union and concatenation.	6	L1	CO4
		OR			
Q.8	a.	Define Greibach Normal Form. Convert the following CFG to GNF. $S \rightarrow AB$; $A \rightarrow aA / bB / b$; $B \rightarrow b$.	6	L2	CO4
	b.	Consider the following CFG : $S \rightarrow ABC / BaB$ $A \rightarrow aA / BaC / aaa$ $B \rightarrow bBb / a / D$ $C \rightarrow CA / AC$ $D \rightarrow \varepsilon$ i) What are useless symbols? ii) Eliminate ε - productions , Unit productions and useless symbols from the grammar.	10	L3	CO4
	c.	Prove that the following languages are not context free. i) $L = \{ai / i \text{ is prime}\}$ ii) $L = \{a^{n^2} / n \geq 1\}$.	4	L2	CO3
		Module – 5			
Q.9	a.	Define a turing machine and explain with neat diagram, the working of a basic turing machine.	6	L1	CO4
	b.	Design a Turing machine to accept the language, $L = \{a^n\,b^n\,c^n / n \geq 1\}$. Draw the transition diagram and show the moves for the string aabbcc.	14	L4	CO4
		OR			
Q.10	a.	Design a Turing machine to accept palindrome over {a, b} and draw the transition diagram.	12	L4	CO5
	b.	Write a short notes on : i) Recursively Enumerable Language. ii) Multitape Turing Machine.	8	L1	CO5

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BCS515B

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Artificial Intelligence

Time: 3 hrs. Max. Marks: 100

Note: **1.** ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***M : Marks , L: Bloom's level , C: Course outcomes.***

		Module – 1	M	L	C
Q.1	a.	Define the following : i) Intelligence ii) Artificial Intelligence iii) Agent iv) Rationality v) Logical reasoning.	5	L2	CO1
	b.	Examine the AI literature to discover whether the following tasks can currently be solved by computers. i) Playing a decent game of table tennis (ping-pong) ii) Discovering and proving new mathematical theorems iii) Giving competent legal advice in a specialized area of law iv) Performing a complex a surgical operation.	8	L2	CO1
	c.	Implement a simple reflex agent for the vacuum environment. Run the environment with this agent for all possible initial dirt configurations and agent locations. Record the performance score for each configuration and the overall score.	7	L3	CO1
		OR			
Q.2	a.	Is AI a science, or is it engineering or neither or both? Explain.	5	L2	CO1
	b.	Write pseudocode agent programs for the goal based and utility based agents.	8	L1	CO1
	c.	For each the following activities give a PEAS description. i) Playing a tennis match ii) Performing a high jump iii) Bidding on an item in an auction.	7	L1	CO1
		Module – 2			
Q.3	a.	Explain why problem formulation must follow goal transformation.	5	L1	CO1
	b.	Give complete problem formulation for each of the following choose a formulation that is precise enough to be implemented. i) Using only four colors, you have to color a planar graph in such a way that no two adjacent regions have the same color. ii) A 3 – foot – tall monkey is in a room where some bananas are suspended from the 8-foot ceiling. He would like to get the bananas. The room contains two stackable, moveable, climbable 3-foot high crates.	8	L2	CO2
	c.	Prove each of the following statements or given counter example : i) Breadth – first search is a special case of uniform – cost search. ii) Uniform – cost search is a special case of A* search.	7	L2	CO2

		OR			
Q.4	**a.**	Define the following terms with example. i) State space ii) Search node iii) Transition model iv) Branching factor.	**8**	**L2**	**CO2**
	b.	Show that the 8-puzzle states are divided in to two disjoint sets, such that any state is reachable from any other state in the same set, while no state is reachable from any state in the other set. Devise a procedure to decide which set a given state is in and explain why this is useful for generating random state.	**7**	**L2**	**CO2**
	c.	Describe a state space in which iterative deepening search performs much worse than depth first search for example, $O(n^2)$Vs $O(n)$).	**5**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Devise a state space in which A^* using GRAPH-SEARCH returns a suboptimal solution with h(n) function that is admissible but inconsistent.	**7**	**L2**	**CO3**
	b.	Which of the following are correct? i) $(A \vee B) \wedge (\neg C \vee \neg D \vee E) F (A \vee B)$ ii) $(A \vee B) \wedge (\neg C \vee \neg D \vee E) F (A \vee B) \wedge (\neg D \vee E)$ iii) $(A \vee B) \wedge \neg (A \Rightarrow B)$ is satistiable iv) $(A \Leftrightarrow B) \Leftrightarrow C$ has the same number of models as $(A \Leftrightarrow B)$	**8**	**L1**	**CO3**
	c.	Consider a vocabulary with only four propositions, A, B, C and D. How many models are there for the following sentences? i) $B \vee C$ ii) $\neg A \vee \neg B \vee \neg C \vee \neg D$ iii) $(A \Rightarrow B) \wedge A \wedge \neg B \wedge C \wedge D$.	**5**	**L1**	**CO3**
		OR			
Q.6	**a.**	Prove that if a heuristic is consistent, it must be admissible. Construct an admissible heuristic that is not consistent.	**8**	**L1**	**CO3**
	b.	Prove each of the following assertions : i) $\alpha \equiv \beta$ if and only if the sentence $(\alpha \Leftrightarrow \beta)$ is valid ii) $\alpha \neq \beta$ if and only if the sentence $\alpha \wedge \neg \beta)$ is unsatisfiable.	**7**	**L1**	**CO3**
	c.	Prove, or find a counter example to each of the following assertions. i) If $\alpha \neq (\beta \wedge \gamma)$ then $\alpha \neq \beta$ and $\alpha \neq \gamma$ ii) If $\alpha \neq (\beta \vee \gamma)$ then $\alpha \neq \beta$ and $\alpha \neq \gamma$ (or) both	**5**	**L1**	**CO3**
		Module – 4			
Q.7	**a.**	Which of the following are valid necessary true sentences? i) $(\exists x\, x = x) \Rightarrow (\forall y \exists z\, y = z)$ ii) $\forall x\, P(x) \vee \neg p(x)$ iii) $\forall x$ smart$(x) \vee (x = x)$	**7**	**L1**	**CO4**
	b.	Prove that universal Instantiation is sound that existential instanticition produces an inferentially equivalent knowledge base.	**5**	**L1**	**CO4**

	c.	Write down logical representations for the following sentences, suitable for use with generalized modulus ponens : i) Horses, cows and pigs are mammals ii) Bluebeard is Charlie's parent iii) Offspring and parent are inverse relations	8	L1	CO4
		OR			
Q.8	a.	Consider a knowledge base containing just two sentence ; P(a) and P(b) does this knowledge base entail $\forall x\, P(x)$? Explain your answer interms of models.	5	L2	CO4
	b.	Suppose a knowledge base contains just one sentence, $\exists x\, AsHigh\, As(x, Everest)$ which of the following are legitimate results of applying existential instantiation? i) AsHighAs(Kilimanjaro, Everest) ii) AsHighAs(Kilimanjaro, Everest) $\wedge$ AsHighAs (Benvevis, Everest)	8	L2	CO4
	c.	Explain how to write any 3-SAT problem of arbitrary size using a single first order definite clause and no more than 30 ground facts.	7	L2	CO4
		Module – 5			
Q.9	a.	i) Give a backward chaining proof of the sentence $7 \leq 3 + 9$. Show only the steps that leads to success ii) Give a forward chaining proof of the sentence $7 \leq 3 + 9$. Show only the steps that leads to success.	8	L1	CO5
	b.	Describe the differences and similarities between problem solving and planning.	5	L2	CO5
	c.	Prove that backward search with PDDL problems is complete.	7	L1	CO5
		OR			
Q.10	a.	The following prolog code defines a predicate P P(x, [x|y]), P(x, [y|z]) :- P(x, z) i) Show proof trees and solutions for the queries P(A, [2, 1, 3]) and P(z,[1, A, 3]) ii) What standard list operation does P represent?	8	L1	CO5
	b.	Explain why dropping negative effects from every action schema in a planning problem results in a relaxed problems.	5	L2	CO5
	c.	Prove the following assertions about planning graphs : i) A literal that does not appear in the final level of the graph connot be achieved. ii) The level cost of a literal in a serial graph is no greater than the actual cost of an optimal plan for achieving it.	7	L1	CO5

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BCS302

Third Semester B.E./B.Tech. Degree Examination, June/July 2025
Digital Design and Computer Organization

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Demonstrate the positive and negative logic using AND gate.	05	L2	CO1
	b.	Show that NAND and NOR function are commutative and but not associative.	05	L3	CO1
	c.	Simplify the Boolean function $F(w,x,y,z) = \Sigma m\ (0,1,2,4,6,7,9,12,14)$ using K-Map and implement using NAND gates.	10	L3	CO1
		OR			
Q.2	a.	What is Binary Logic? List out any 4 laws of logic.	05	L1	CO1
	b.	Find the POS expression for $F(A.B.C,D) = \prod M(2,3,5,8,10,13,14) + d(1,6,7,11)$ and realize it using NOR gates.	05	L3	CO1
	c.	Simplify the following Boolean functions using K-map and write the verilog program for realizing the minimized expression. i) $F(X,Y,Z) = \Sigma m\ (0,1,4,5,6) + d\ (2,3)$ ii) $F(W,X,Y,Z) = \Sigma m\ (5,6,7,12,14,15) + d(9,11,13)$	10	L3	CO1
		Module – 2			
Q.3	a.	Define Decoder Implement the following boolean functions using a decoder $F_1(A,B,C) = \Sigma m(1,3,4,7)$ $F_2(A,B,C) = \Sigma m(0,2,,3,6)$	06	L3	CO2
	b.	Write the verilog program to implement full adder and full sub tractor circuits.	06	L3	CO2
	c.	Design an octal to Binary Encoder.	08	L3	CO2
		OR			
Q.4	a.	Define Multiplexer. Implement the Boolean function $F(A,B,C,D) = \Sigma m(1,3,4,11,12,13,14,15)$ with 8:1 multiplexer.	06	L3	CO2
	b.	Explain the working of 4 – bit adder using 4 full adders.	06	L2	CO2
	c.	Write the characteristic equation, Excitation table and FSM representations for SR,JK and D flip flops	08	L2	CO2
		Module – 3			
Q.5	a.	With a block diagram explain the processor and Memory communication.	06	L2	CO3
	b.	With relevant examples, Explain the following addressing modes. i) Index ii) Base with index and offset iii) Indirect.	06	L2	CO3
	c.	Demonstrate the instruction execution and sequencing for C←[A] +[B]	08	L2	CO3

		OR			
Q.6	**a.**	Describe the Big Endian and little endian address assignment with examples	**06**	**L2**	**CO3**
	b.	The Registers R1 and R2 has decimal values 1200 and 4600. Calculate the EA of the memory operand in each of the following instructions when they are executed in sequence. i) load 20 (R1), R5 ii) Move # 3000, R5 iii) Store R5, 30(R1,R2) iv) add – (R2), R5 v) Sub (R1)+, R5 vi) add (R2)+,R1	**06**	**L3**	**CO3**
	c.	Demonstrate the Branching operations using a loop to add n – numbers with block diagram.	**08**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the effect of size, cost and speed in Memory hierarchy.	**10**	**L2**	**CO4**
	b.	Explain Centralized and distributed Bus arbitration approaches.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Describe the different memory mapping functions.	**10**	**L2**	**CO4**
	b.	Explain how to handle interrupt from multiple devices using daisy chain and priority scheme.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	With a neat diagram, explain the single bus organization of the data path inside a processor.	**10**	**L2**	**CO5**
	b.	Describe in detail, the basic idea of instruction pipeline.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the complete set of operations involved in executing the instruction ADD (R3), R1 along with control sequence.	**10**	**L2**	**CO5**
	b.	Explain the process of storing a word from processor to memory.	**10**	**L2**	**CO1**

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BCS303

Third Semester B.E./B.Tech. Degree Examination, June/July 2025
Operating Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define operating system. Briefly explain what operating system do.	06	L1	CO1
	b.	What is caching? List and explain performance of various levels of storage.	08	L1	CO1
	c.	What are the different special purpose system ? List them and explain each in brief.	06	L1	CO1
		OR			
Q.2	a.	Explain different operating system services which are helpful to the user.	06	L2	CO1
	b.	Define system calls. Explain with example how system calls are used.	08	L1	CO1
	c.	Discuss in detail about Operating System structure.	06	L2	CO1
		Module – 2			
Q.3	a.	Define process. Explain with a neat diagram of process state.	08	L1	CO2
	b.	Describe the difference among short term, medium term and long term scheduling.	06	L3	CO2
	c.	Differentiate the advantages and disadvantages of synchronous and asynchronous communication	06	L3	CO2
		OR			
Q.4	a.	Consider the following set of process, with the length of the CPU burst given in milliseconds: Process | Burst Time | Priority P1 | 10 | 3 P2 | 1 | 1 P3 | 2 | 3 P4 | 1 | 4 P5 | 5 | 2 i) Draw the Gantt Charts for: FCFS, SJF, non preemptive priority scheduling algorithms and RR (quantum = 1) ii) Calculate turnaround time and waiting time of each of process for the scheduling algorithms in part a.	08	L3	CO2
	b.	Explain with example of single threaded and multi threaded process.	06	L2	CO2
	c.	Explain with a neat diagrams of multithreading models.	06	L2	CO2
		Module – 3			
Q.5	a.	Define semaphores. Explain mutual exclusion implementation with semaphores.	10	L1	CO3
	b.	What is a deadlock? Explain the situation of the dining philosophers problem.	10	L1	CO3

OR

Q.6	**a.**	Explain necessary conditions of deadlock and what are methods used for handling deadlocks.	**10**	**L2**	**CO3**
	b.	Consider the following snapshot of a system:	**10**	**L3**	**CO3**

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Answer the following questions using Bankers algorithm :
i) What is the content of the matrix Need ?
ii) Is the system in safe state?
iii) If a request from process P1 arrives for (0,4,2,0) can the request be granted immediately?

Module – 4

Q.7	**a.**	Discuss the following : First fit, Best fit and worst fit.	**06**	**L1**	**CO4**
	b.	Explain with a neat diagram paging for a 32 – bytes memory with 4 – byte pages.	**08**	**L2**	**CO4**
	c.	Explain with a neat diagram segmentation Hardware.	**06**	**L2**	**CO4**

OR

Q.8	**a.**	Explain Demand paging with a neat diagram.	**06**	**L2**	**CO4**
	b.	How many page faults occur for the following reference string with three page frames. Using FIFO, optional and LRU algorithms. (7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1)	**08**	**L2**	**CO4**
	c.	Explain Thrashing with a neat diagram.	**06**	**L1**	**CO4**

Module – 5

Q.9	**a.**	Explain different allocation methods of file systems.	**08**	**L2**	**CO5**
	b.	With a neat diagram Explain File system mounting?	**06**	**L1**	**CO5**
	c.	Define the file attributes, List different file operations and explain each in brief.	**06**	**L1**	**CO5**

OR

Q.10	**a.**	Suppose that a disk drives has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder No. 43 and the previous request was at cylinder 125. The queue of pending requests in FIFO order is : 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from the current Lead position, what is the total distance (in cylinders)that the disk arm moves to satisfy all the pending requests for each of the following disk – scheduling algorithms? a) FCFS b) SSTF c) SCAN d) C - SCAN	**08**	**L3**	**CO5**
	b.	List and explain different goals and protection of an operating system.	**06**	**L2**	**CO6**
	c.	Discuss different file access methods	**06**	**L2**	**CO5**

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CBCS SCHEME

USN | | | | | | | | | | | **BCS304**

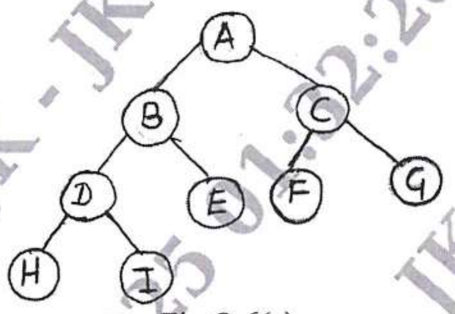
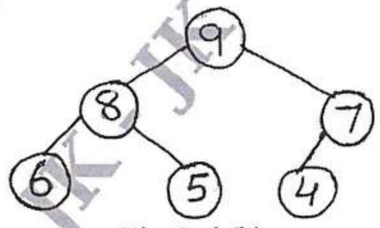
Third Semester B.E./B.Tech. Degree Examination, June/July 2025

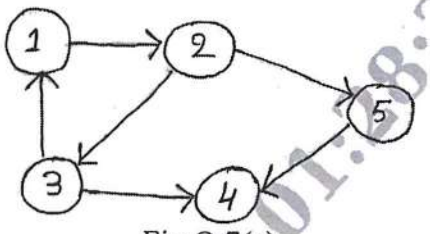
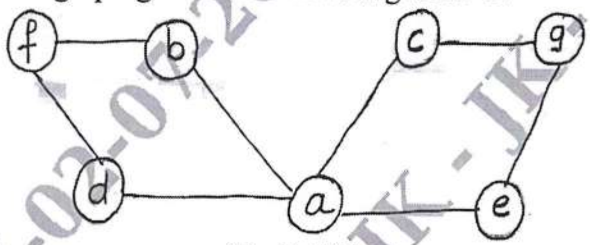
Data Structures and Applications

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define data structure. With a neat diagram, explain the classification of data structure.	5	L1	CO1
	b.	Explain dynamic memory allocation functions with suitable examples.	5	L2	CO1
	c.	For the given sparse matrix draw the triplet representation and also draw the transpose of resultant triplet. $A = \begin{bmatrix} 15 & 0 & 0 & 22 & 0 & -15 \\ 0 & 11 & 3 & 0 & 0 & 0 \\ 0 & 0 & 0 & -6 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 91 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 28 & 0 & 0 & 0 \end{bmatrix}$	10	L3	CO1
		OR			
Q.2	a.	Define stack. With suitable example write the array representation of stack.	5	L1	CO2
	b.	Write a C functions to implement push( ), pop( ) and display( ) operations for stack using array.	5	L2	CO2
	c.	Translate the following infix expressions to postfix form using stack: i) ((A * B) + C) / D ii) A * B * C + D	10	L3	CO2
		Module – 2			
Q.3	a.	What are the disadvantages of linear queue?	5	L1	CO2
	b.	With suitable example discuss the representation of linear queue with array.	5	L2	CO2
	c.	Develop functions in C to implement insertion, deletion and display operations on circular queue of integers.	10	L3	CO2
		OR			
Q.4	a.	What is linked list? With suitable examples explain different types of linked lists.	5	L1	CO3
	b.	Write a C functions to implement a stack of integers using a Singly Linked List (SLL).	5	L2	CO3

	c.	Develop a functions in C for the following operations on singly linked list of integers: i) Insert a element at end of SLL ii) Delete a element at end of SLL iii) Concatenation of two SLL	10	L3	CO3
		Module – 3			
Q.5	**a.**	Write a structure definition for Doubly Linked List (DLL) of integers. What are the advantages of DLL over SLL?	4	L1	CO3
	b.	Develop a C functions for the following operations on DLL of integers: i) Insert a node at front of DLL ii) Delete a node at end of DLL	10	L3	CO3
	c.	For the given sparse matrix design the linked list representation. $A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 4 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 8 & 0 & 0 & 1 \\ 0 & 0 & 6 & 0 \end{bmatrix}$	6	L4	CO3
		OR			
Q.6	**a.**	Define binary tree. Write array and linked list representation for given binary tree.  Fig.Q.6(a)	4	L1	CO4
	b.	Develop recursive C functions for inorder, preorder and postorder traversal of a binary tree. Find inorder, preorder and postorder traversals for the given binary tree.  Fig.Q.6 (b)	10	L3	CO4
	c.	Design threaded binary tree for the given elements 10, 20, 30, 40, 50	6	L4	CO4

		Module – 4			
Q.7	**a.**	Write a adjacency matrix and adjacency linked list representation for following given graph.  Fig.Q.7(a)	**6**	**L1**	**CO4**
	b.	Develop a C function to traverse a graph using Depth First Search (DFS). Apply DFS for the graph given below starting from C.  Fig.Q.7(b)	**8**	**L4**	**CO4**
	c.	List and explain different types of selection trees with suitable examples.	**6**	**L4**	**CO4**
		OR			
Q.8	**a.**	Define forest data structure. With a suitable example write a procedure to transform forest into binary tree.	**6**	**L1**	**CO4**
	b.	For a given data design a binary search tree. Apply inorder, preorder and postorder traversals on resultant binary search tree. 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2	**8**	**L4**	**CO4**
	c.	Develop a C functions to perform the following operations on Binary Search Tree (BST): i) Inserting an element into BST ii) Recursive search of given key element on BST.	**6**	**L4**	**CO4**
		Module – 5			
Q.9	**a.**	Explain hashing with suitable example. Explain different types of hashing functions in details.	**10**	**L2**	**CO5**
	b.	Explain static hashing and dynamic hashing in detail.	**10**	**L2**	**CO5**
		OR			
Q.10		Write a note on:			
	a.	Leftist trees	**6**	**L2**	**CO5**
	b.	Optimal binary search trees	**7**	**L2**	**CO5**
	c.	Priority queues.	**7**	**L2**	**CO5**

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CBCS SCHEME

USN | | | | | | | | | | |

BCS306A

Third Semester B.E./B.Tech. Degree Examination, June/July 2025
Object Oriented Programming with Java

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	List and explain control statements in Java with programming example.	10	L1	CO1
	b.	List and explain operators in Java.	10	L1	CO1
		OR			
Q.2	a.	How are arrays declared and initialized in Java. Explain with suitable example.	10	L2	CO1
	b.	Develop a Java program to add two matrices of suitable order N.	10	L6	CO1
		Module – 2			
Q.3	a.	With code Snippet, explain different Access specifiers in Java.	10	L2	CO2
	b.	Explain the Garbage collection and finalize ( ) method in Java.	10	L2	CO2
		OR			
Q.4	a.	With code snippet, explain method overloading in Java.	10	L3	CO3
	b.	Develop a stack class to hold a maximum of 10 integers with suitable methods. Develop a Java main method to illustrate stack operations.	10	L6	CO2
		Module – 3			
Q.5	a.	What is inheritance? Discuss different types of inheritance with suitable example.	10	L2	CO3
	b.	Develop a Java program to create a class named SHAPE, create three sub classes namely CIRCLE, TRIANGLE and SQUARE. Each class has two member functions named DRAW ( ) and ERASE ( ). Demonstrate polymorphism concept by developing suitable methods, defining member data and main program.	10	L6	CO3
		OR			
Q.6	a.	Demonstrate with code snippet method overriding in Java and justify with code snippet prevention of overriding in inheritance.	10	L3	CO3
	b.	Briefly explain implementation of interface by taking suitable example.	10	L2	CO3
		Module – 4			
Q.7	a.	What is package? How to create and import packages in Java.	10	L2	CO4
	b.	What is an exception? Explain the followings : (i) try (ii) catch (iii) throw (iv) throws (v) finally	10	L2	CO4

		OR			
Q.8	**a.**	How do you create your own exception class? Explain with code snippet.	**10**	**L2**	**CO4**
	b.	Explain the following terms with respect to packages : (i) Built-in Exceptions (ii) Access protection for packages	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	What is multithreading? List and explain the methods to implement multithreading.	**10**	**L2**	**CO5**
	b.	Explain the followings : (i) Enumeration (ii) Type wrappers	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	List and explain benefits of multi-threading.	**10**	**L1**	**CO5**
	b.	What is Autoboxing? Write a Java Program that demonstrates autoboxing/unboxing occurs inside expressions.	**10**	**L3**	**CO5**

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CBCS SCHEME

USN | | | | | | | | | | |

BCS401

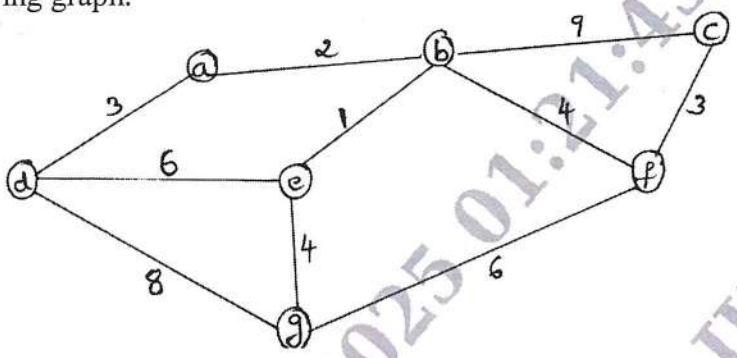
Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Analysis and Design of Algorithms

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

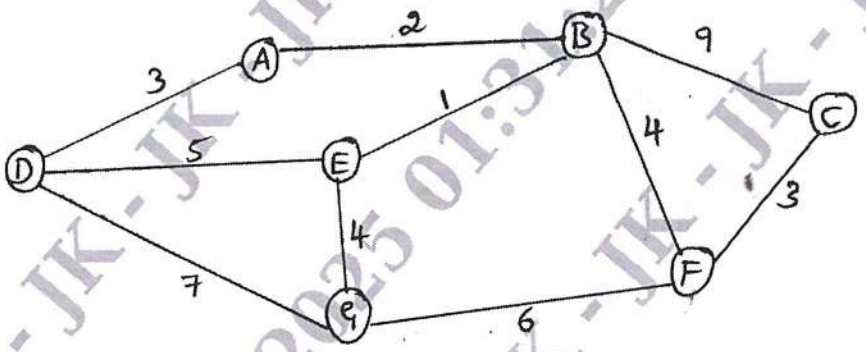
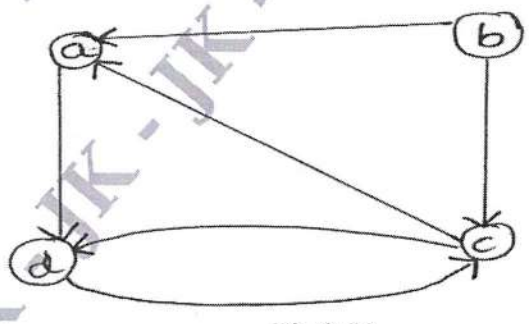
		Module – 1	M	L	C
Q.1	a.	Define algorithm Explain asymptotic notations Bigh oh, Big omega and Big theta notations.	08	L2	CO1
	b.	Explain the general plan for analyzing the efficiency of a recursive algorithm. Suggest a recursive algorithm to find factorial of number. Derive its efficiency.	08	L3	CO1
	c.	If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then show that $t_1(n) + t_2(n) \in o(\max\{g_1(n), g_2(n)\})$	04	L2	CO1
		OR			
Q.2	a.	With a neat diagram explain different steps in designing and analyzing algorithm.	08	L2	CO1
	b.	Write an algorithm to find the max element in an array of n elements. Give the mathematical analysis of this non- recursive algorithm.	08	L3	CO1
	c.	With the algorithm derive the worst case efficiency for selection sort.	04	L3	CO1
		Module – 2			
Q.3	a.	Explain the concept of divide and conquer. Design an algorithm for merge sort and derive its time complexity.	10	L3	CO2
	b.	Design an algorithm for insertion algorithm and obtain its time complexity. Apply insertion sort on these elements. 89, 45, 68, 90, 29, 34, 17	10	L3	CO2
		OR			
Q.4	a.	Design an algorithm for Quick sort. Apply quick sort on these elements. 5, 3, 1, 9, 8, 2, 4, 7.	10	L3	CO2
	b.	Explain Strassen's Matrix multiplication and derive its time complexity.	10	L2	CO2
		Module – 3			
Q.5	a.	Define AVL trees. Explain its four rotation types.	10	L2	CO3
	b.	Design an algorithm for Heap sort. Construct bottom – up heap for the list 15, 19, 10, 7, 17, 16.	10	L3	CO4
		OR			
Q.6	a.	Design Horspool's Algorithm for string matching Apply Horspool algorithm to find pattern BARBER in the test: JIM_SAW_ME_IN_A_BARBERSHOP.	10	L3	CO4
	b.	Define heap. Explain the properties of heap along with its representation.	10	L2	CO3

Module – 4

Q.7	**a.**	Construct minimum cost spanning tree using Kruskal's algorithm for the following graph.  Fig. 7(a)	**10**	**L3**	**CO4**
	b.	What are Huffman trees? Construct the Huffman tree for the following data i) Encode the text ABAC ABAD ii) Decode the code100010111001010	**10**	**L3**	**CO4**

Character	A	B	C	D	-
Probability	0.4	0.1	0.2	0.15	0.15

OR

Q.8	**a.**	Apply Dijkstra's algorithm to fine single source shortest path for the given graph by considering A as the source vertex.  Fig.8 (a)	**10**	**L3**	**CO4**
	b.	Define transitive closure of a graph. Apply Warshall's algorithm to compute transitive closure of a directed graph.  Fig.8 (b)	**10**	**L3**	**CO4**

Module – 5

Q. No.		Question	Marks	Level	CO
Q.9	a.	Explain the following with examples. i) P problem ii) NP problem ii) NP-Complete problem iv) NP – Hard problem	10	L2	CO5
	b.	What is backtracking? Apply backtracking to solve the below instance of sum of subset problem. S = { 1, 2, 5, 6, 8} and d = 9.	10	L3	CO6

OR

Q. No.		Question	Marks	Level	CO
Q.10	a.	Illustrate N Queen's problem using backtracking to solve 4 – Queens problem.	10	L2	CO6
	b.	Using Branch and Bound method solve the below instance of Knapsack Problem. (table below)	10	L3	CO6

Item	Weight	Value
1	4	40
2	7	42
3	5	25
4	3	12

Capacity = 10

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CBCS SCHEME

USN | | | | | | | | | | | **BCS402**

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Microcontrollers

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the major design rules to implement the RISC design philosophy.	08	L2	CO1
	b.	Differentiate between RISC and CISC processors.	04	L2	CO1
	c.	Explain ARM core data flow model, with neat diagram.	08	L2	CO1
		OR			
Q.2	a.	With the help of bit layout diagram, explain Current Program Status Register (CPSR) of ARM.	08	L2	CO1
	b.	With an example, explain the pipeline in ARM.	05	L2	CO1
	c.	Discuss the following with diagrams: (i) Von-Neuman architecture with cache (ii) Harvard architecture with TCM	07	L2	CO1
		Module – 2			
Q.3	a.	Explain the different data processing instructions in ARM.	08	L2	CO2
	b.	Explain the different branch instructions of ARM.	04	L2	CO2
	c.	Explain the following ARM instructions: (i) MOV r_1, r_2 (ii) ADDS r_1, r_2, r_4 (iii) BIC r_3, r_2, r_5 (iv) CMP r_3, r_4 (v) UMLAL r_1, r_2, r_3, r_4	08	L2	CO2
		OR			
Q.4	a.	Explain the different load store instructions in ARM.	08	L2	CO2
	b.	With an example, explain full descending stack operations.	07	L2	CO2
	c.	Develop an ALP to find the sum of first 10 integer numbers.	05	L3	CO2
		Module – 3			
Q.5	a.	List out basic C data types used in ARM. Develop a C program to obtain checksums of a data packet containing 64 words and write the compiler output for the above function.	08	L2	CO3
	b.	Explain the C looping structures in ARM.	08	L2	CO3
	c.	Explain pointer aliasing in ARM.	04	L2	CO2

		OR			
Q.6	**a.**	With an example, explain function calls in ARM.	**08**	**L2**	**CO3**
	b.	Explain register allocation in ARM.	**07**	**L2**	**CO3**
	c.	Write a brief note on portability issues when porting C code to ARM.	**05**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the ARM processor exceptions and modes, vector table and exception priorities.	**10**	**L2**	**CO4**
	b.	Explain the interrupts in ARM.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain the ARM firmware suite and red hat redboot.	**10**	**L2**	**CO4**
	b.	Explain the sandstone directory layout and sandstone code structure.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the basic architecture of a cache memory and basic operation of a cache controller.	**10**	**L2**	**CO5**
	b.	With a neat diagram, explain a 4 KB, four way set associative cache.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the write buffers and measuring cache efficiency.	**08**	**L2**	**CO5**
	b.	Explain the cache policy.	**12**	**L2**	**CO5**

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CBCS SCHEME

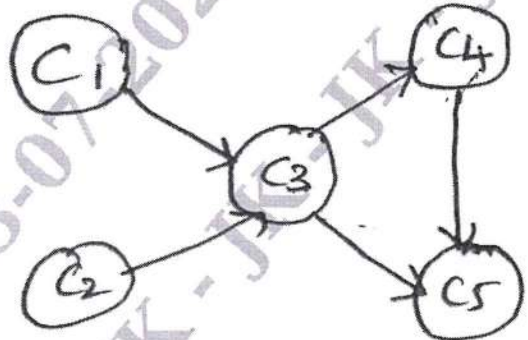
USN | | | | | | | | | | | **BCO402**

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Analysis and Design Algorithms

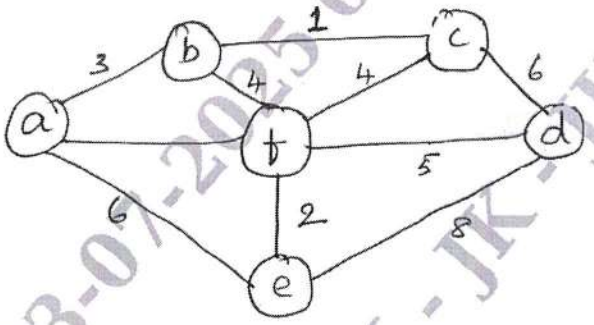
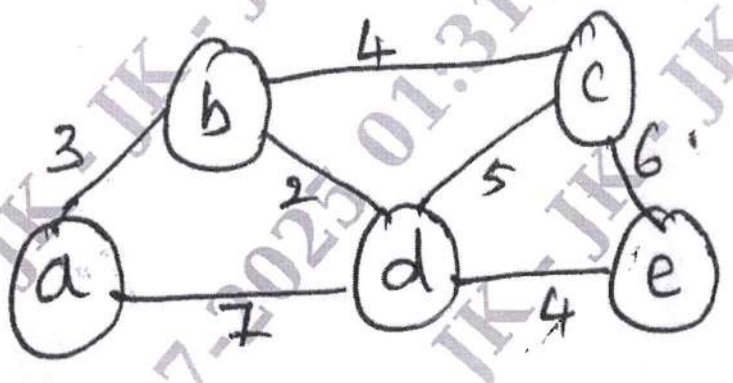
Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is algorithm? Elaborately arymptotic notations for analysis of an algorithm with an example.	06	L1	CO1
	b.	Explain the general plan for analyzing the efficiency of a recursive algorithm. Suggest a recursive algorithm to fund factorial of number. Derive its efficiency.	10	L1	CO1
	c.	Write an algorithm using recursion that determine the GCD (m,n) of two numbers. Determine the time and space complexity.	04	L1	CO1
		OR			
Q.2	a.	Write neat diagram explain different steps in designing and analyzing an algorithm.	07	L2	CO1
	b.	Explain the general plan of mathematical analysis of non-recursive algorithm with suitable example.	06	L2	CO1
	c.	Design and implement an algorithm for sort a given set of n integer elements using Selection sort – method and compute its time complexity.	07	L3	CO3
		Module – 2			
Q.3	a.	Explain the concept of divide and conquer. Design an algorithm for merge sort and derive its time complexity.	10	L1	CO2
	b.	Design an insertion sort algorithm and obtain its time complexity, example of sorting with insertion sort.	10	L2	CO3
		OR			
Q.4	a.	Explain strassen's matrix multiplication and derive its time complexity.	10	L2	CO1
	b.	Apply source removal method to obtain topological sort for the given graph.	10	L3	CO2



		Module – 3	M	L	C
Q.5	a.	Define AVL Trees. Explain into four rotation types.	10	L3	CO3
	b.	Construct bottom up heap for the list 2,9,7,6,5,8 . Obtain its time complexity.	10	L3	CO3

		OR			
Q.6	**a.**	Define heap Explain the properties of heap along with its representation.	**10**	**L3**	**CO3**
	b.	Design Harspool algorithm for string matching. Apply Horspools algorithm to find the pattern BARBER in the text: JIM_SAW_ME_IN_A_BARBER SHOP	**10**	**L2**	**CO5**
		Module – 4			
Q.7	**a.**	Construct minimum cost spanning tree using Krustal's algorithm for the following graph. 	**10**	**L2**	**CO1**
	b.	What are Huffman Tree? Construct the Huffmam tree for the following date. Character A B C D Probability 0.35 0.1 0.2 0.2 0.15 Encode DAD –CBE using Huffman Encoding.	**10**	**L2**	**CO1**
		OR			
Q.8	**a.**	Apply Dijkstra's algorithm to find single source shortest path for the given graph by considering a as the source vertex. 	**10**	**L2**	**CO1**
	b.	Define transitive closure of a graph. Apply warshalls algorithm to compute transitive closure of a directed graph. 0 1 0 0 / 0 0 0 1 / 0 0 0 0 / 1 0 1 0	**10**	**L1**	**CO1**

Module – 5

Q.9	a.	Explain the following with examples. i) P Problem ii) NP Problem iii) NP – Compete Problem iv) NP – Hard Problems	10	L1	CO1
	b.	What is backtracking? Apply backtracking to solve the below instance of sum of sub set. Problem A = { 1,2,5,6,8 } d = 9	10	L1	CO2
		OR			
Q.10	a.	Illustrate N Queen's problem using backtracking to solve 4 – Queens problem.	10	L2	CO3
	b.	Using Branch and Bound technique solve the below instance of Knapsack problem. (see table below) Capacity = 10	10	L3	CO4

Item	Weight	Value
1	4	40
2	7	42
3	5	25
4	3	12

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CBCS SCHEME

USN | | | | | | | | | | |

BCS403

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Database Management Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the types of attributes with example.	4	L2	CO1
	b.	Define database. Explain the main characteristics of the database approach.	8	L2	CO1
	c.	Show the ER diagram for an EMPLOYEE database by assuming your own entities (minimum 4) attributes and relationships, mention cardinality ratios wherever appropriate.	8	L3	CO2
		OR			
Q.2	a.	Describe the three schema architecture.	4	L2	CO1
	b.	Explain the component models of DBMS and their interaction with the help of diagram.	8	L2	CO1
	c.	Design ER diagram for a university database by assuming your own entities (4). Mention primary key , constraints and relationships.	8	L3	CO2
		Module – 2			
Q.3	a.	Explain relational model constraints.	6	L2	CO1
	b.	Explain the characteristics of relations with suitable example for each.	6	L2	CO1
	c.	Considering the following schema : Sailors (sid , sname , rating , age) Boats (bid , bname , color) Reserves (sid , bid , day) Write a relational algebra queries for the following : i) Find the names of sailors, who have reserved red and a green boat. ii) Find the names of sailors who have reserved a red boat. iii) Find the names of sailors who have reserved a red or green boat. iv) Find the names of sailors who have reserved all boats.	8	L3	CO1
		OR			
Q.4	a.	Explain the steps to convert the basic ER model to relational Database schema.	6	L2	CO1
	b.	Explain Unary relational operations with example.	6	L2	CO1

	c.	Consider the relation schema Employee database. EMPLOYEE (Fname ,Minit , Lname , SSn , Bdates , Address , Sex , Salary Super_SSn , Dno) DEPARTMENT (Dname , Dnumber , Mgr_SSn , Mgr_start_date) PROJECT (Pname , PNumber , Plocation , Dnum) WORKS_ON (Essn , Pno , Hours) DEPENDENT (Essn , Dependent_name , sex, Bdate , Relationship) Write relational algebra queries for the following : i) Retrieve the name and address of all employees who work for the 'Research' department. ii) List the names of all employees with 2 or more dependents. iii) Find the names of employees who work on all the projects controlled by department number 5. iv) List the names of employees who have no dependents.	8	L3	CO3
		Module – 3			
Q.5	a.	What is the need for normalization? Explain second and third normal form with examples.	6	L2	CO4
	b.	Outline constraints in SQL.	6	L2	CO1
	c.	Identify the given Relation R(ABCDE) and its instance, check whether FDS given hold or not. Give reasons. i) $A \rightarrow B$ ii) $B \rightarrow C$ iii) $D \rightarrow E$ iv) $CD \rightarrow E$. A B C D E a_1 b_1 c_1 d_1 e_1 a_1 b_2 c_1 d_1 e_1 a_2 b_2 c_1 d_2 e_3 a_2 b_3 c_3 d_2 e_2	8	L3	CO4
		OR			
Q.6	a.	What is Multivalued dependency? Explain 4NF and 5NF with suitable example.	6	L2	CO4
	b.	Outline the informal design guidelines for relational schema.	6	L2	CO4
	c.	Consider relation R with following function dependency : EMPPROJ (SSn , Pnumber , Hours , Ename , Pname , Plocation) SSN , Pnumber $\rightarrow$ Hours, SSN $\rightarrow$ Ename Pnumber $\rightarrow$ Pname , Plocation. Is it 2NF? Verify? If no give reason.	8	L3	CO4

		Module – 4			
Q.7	**a.**	Consider the following schema for a company database : Employee (FName , LName , SSn , Adderss , Sex , Salary , Dno , Super_SSn) Department (Dname , Dnumber , mgr_SSn, mgr_st_date) Project (Pname , Pnumber , Plocation , Dnum) WORKS_on (Essn , Pno , Hours) DEPENDENT (Essn , Dependent name , Sex , Bdate, relationship). Write the SQL queries for the following : i) List the names of managers who have atleast one dependent (use correlated nested). ii) Retrieve the name of each employee who has a dependent with the same first name and is the same sex as the employee. iii) For each project retrieve the project number , project name and the number of employees who work on that project. iv) Retrieve the SSN of all employees who work on project number 1, 2 or 3. (Use 1N). v) Find the sum of the salaries of all employees of the 'Research' department as well as maximum salary , minimum salary , average salary in this department.	**10**	**L3**	**CO3**
	b.	Why concurrency control is needed? Demonstrate with an example.	**10**	**L2**	**CO5**
		OR			
Q.8	**a.**	Consider the following schedule. The actions are listed in the order they are scheduled and prefixed with the transaction name. S1 : T1 : R(X) , T2 : R(X) T1 : W(Y) , T2 : W(Y) , T1 : R(Y) , T2 : R(Y) S2 : T3 : W(X) , T1 : R(X) , T1 : W(Y) , T2 : R(Z) , T2 : W(Z) , T3 : R(Z) For each schedule answer the following : i) What is the precedence graph for the schedule? ii) Is the schedule conflict_serializable? If so what are all the conflicts equivalent serial schedules? iii) Is the schedule view serializable? If so what are all the view equivalent serial schedules?	**10**	**L3**	**CO5**
	b.	Explain triggers with example write a trigger in SQL to call a procedure "Inform_Supervisor" whenever an employees salary is greater than the salary of his or her direct supervisor in the COMPANY database.	**10**	**L3**	**CO5**
		Module – 5			
Q.9	**a.**	Describe the two – phase locking protocol for concurrency control provide example to illustrate how it ensures serializability in transaction schedule.	**10**	**L2**	**CO5**
	b.	Explain the characteristics of NOSQL system.	**10**	**L2**	**CO6**
		OR			
Q.10	**a.**	Explain binary locks and shared lock with algorithm.	**10**	**L2**	**CO5**
	b.	Explain MongoDB data model, CRUD operations and distributed system characteristics.	**10**	**L2**	**CO6**

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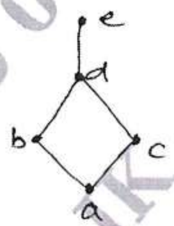
BCS405A

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Tautology, show that $[(p \vee q) \wedge \{(p \to r) \wedge (q \to r)\}] \to r$	6	L1	CO1
	b.	Prove the following using the laws of logic : $\neg [\{(p \vee q) \wedge r\} \to \neg q] \Leftrightarrow \neg [\neg[(p \vee q) \wedge r] \vee . \neg q] \Leftrightarrow q \wedge r$.	7	L2	CO1
	c.	Give i) a direct proof ii) an Indirect proof for the following statement "If n is an odd integer then n + 9 is an even integer".	7	L2	CO1
		OR			
Q.2	a.	Define i) an open statement ii) quantifiers.	6	L2	CO1
	b.	Test the validity of the following arguments. i) $p \wedge q$, $p \to (q \to r)$, $\therefore r$ ii) P, $P \to \sim q$, $\sim q \to \sim r$, $\therefore \sim r$	7	L2	CO1
	c.	For the following statements the universe comprises all non – zero integers. Determine the truth value of each statement. i) $\exists x, \exists y\ [xy = 1]$ ii) $\exists x, \forall y\ [xy = 1]$ iii) $\forall x, \exists y\ [xy = 1]$ iv) $\exists x, \exists y\ [(2x + y = 5) \wedge (x - 3y = -8)]$ v) $\exists x, \exists y\ [(3x - y = 17) \wedge (2x + 4y = 3)]$.	7	L2	CO1
		Module – 2			
Q.3	a.	Define the well ordering principle. By Mathematical induction, prove that $1 + 2 + 3 + \ldots.. + n = \frac{1}{2}n(n+1)$, $n \in z^+$.	6	L2	CO2
	b.	Prove that $F_n = \frac{1}{\sqrt{5}}\left[\left(\frac{1+\sqrt{5}}{2}\right)^n - \left(\frac{1-\sqrt{5}}{2}\right)^n\right]$. For F_0, F_1, F_2, …. are the Fibonacci numbers.	7	L2	CO2
	c.	Find the number of permutations of the letters of the word 'MASSASAUGA'. In how many of these all four A's are together? How many of them begin with S's?	7	L3	CO2
		OR			

Q.4	a.	Prove that $4n < n^2 - 7$ for all positive integers $n \geq 6$.	6	L2	CO3
	b.	Find the co-efficients of $x^9 y^3$ in the expansion of $(2x - 3y)^{12}$.	7	L3	CO3
	c.	Let $a_0 = 1$, $a_1 = 2$, $a_3 = 3$ and $a_n = a_{n-1} + a_{n-3}$ for $n \geq 3$, prove that $a_n \leq 3^n$ for all +ve integers n.	7	L2	CO3
		Module – 3			
Q.5	a.	State Pigeon hole principle. Prove that if 30 dictionaries in a library contains a total of 61,327 pages then atleast one of dictionaries must have atleast 2045 pages.	6	L2	CO3
	b.	Define power set. For any sets A, B, $C \leq U$, prove that $A \times (B \cup C) = (A \times B) \cup (A \times C)$.	7	L2	CO3
	c.	Let f and g be functions from R to R defined by $f(x) = ax + b$ and $g(x) = 1 - x + x^2$ if $(gof)(x) = 9x^2 - 9x + 3$, determine a & b.	7	L3	CO3
		OR			
Q.6	a.	Let $f : R \rightarrow R$ be defined by $f(x) = \begin{cases} 3x - 5, \text{if } x > 0 \\ 1 - 3x, \text{if } x \leq 0 \end{cases}$ Find $f^1(-5, 5)$ and $f^1(-6, 5)$.	6	L2	CO3
	b.	Let N be the set of Natural numbers. Let a relation R be defined by $R = \{(a, b) / a \in N, b \in N, a - b \text{ is divisible by } 5\}$. Prove that R is an equivalence relation.	7	L2	CO3
	c.	For A = { a, b, c, d, e}, the Hasse diagram for the poset(A, R) is as shown below : i) Determine the relation matrix for R ii) Construct the diagraph for R. 	7	L3	CO3
		Module – 4			
Q.7	a.	Determine the number of integers between 1 and 250 that are divisible by 3 and not divisible by 5 and 7.	6	L3	CO4
	b.	Solve the recurrence relation $F_{n+2} = F_{n+1} + F_n$, where $n \geq 0$ and $F_0 = 0$, $F_1 = 1$.	7	L2	CO4
	c.	Define Derangement. Find the number of derangement of 1, 2, 3, and 4.	7	L3	CO4
		OR			

<table>
<tr><td>Q.8</td><td>a.</td><td>Find the Rook polynomial for the chess board contain 4 squares as shown in the Fig.Q8(a).
<table><tr><td>1</td><td>2</td></tr><tr><td>3</td><td>4</td></tr></table>Fig.Q8(a)</td><td>6</td><td>L3</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>Solve the recurrence relation $a_n = 5a_{n-1} + 6a_{n-2}$, $n \geq 2$, $a_0 = 1$, $a_1 = 3$.</td><td>7</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>c.</td><td>Find the distinct numbers which are multiples of at least one of 15, 40 and 35 not exceeding 1000.</td><td>7</td><td>L3</td><td>CO4</td></tr>
<tr><td colspan="6">Module – 5</td></tr>
<tr><td>Q.9</td><td>a.</td><td>Define group and subgroup with example each.</td><td>6</td><td>L1</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>State and prove Lagrange's theorem.</td><td>7</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>c.</td><td>Define Klein 4 group. Verify A = {e, a, b, c} is a Klein 4 group.</td><td>7</td><td>L2</td><td>CO5</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.10</td><td>a.</td><td>Prove that the intersection of two subgroup of a group is a subgroup of the group.</td><td>6</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>Prove that the cube roots of unity form a group under the multiplication.</td><td>7</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>c.</td><td>Let G = S_4, the symmetric group of order 4, for $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}$, find the subgroup $H = \langle a \rangle$, determine the number of left cosets of H in G.</td><td>7</td><td>L3</td><td>CO5</td></tr>
</table>

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BIS402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Advanced Java

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is Collection Framework? Explain the methods define by the collection interface.	7	L2	CO1
	b.	Demonstrate ArrayList class collection with example.	7	L2	CO1
	c.	Explain how collections can be accessed using an iterator with example.	6	L2	CO1
		OR			
Q.2	a.	Explain the following map classes: i) HashMap ii) TreeMap.	10	L2	CO1
	b.	What are comparators? Write a comparator program to sort accounts by last name.	10	L3	CO1
		Module – 2			
Q.3	a.	Explain the string comparison functions with suitable program.	6	L2	CO2
	b.	Explain the following built in methods with respect to StringBuffer class: i) capacity( ) ii) delete( ) iii) replace( ) iv) append( ) v) substring( )	7	L2	CO2
	c.	Write a Java program that demonstrates any four constructors of string class.	7	L3	CO2
		OR			
Q.4	a.	Write a Java program to remove duplicate characters from a given string and display the resultant string.	7	L3	CO3
	b.	Explain character extraction functions in string class.	7	L2	CO2
	c.	Explain constructors in Java string builder class.	6	L2	CO2

		Module – 3			
Q.5	**a.**	Explain the difference between AWT and Swing. What are two key features of swing and explain.	**6**	**L2**	**CO3**
	b.	What is JLabel class? Explain with example of any three constructors and methods of JLabel class.	**7**	**L2**	**CO3**
	c.	Write a Java program in swing event handling applications that creates 2 buttons ALPHA and BETA and displays the text "Alpha pressed" when Alpha button is clicked and "Beta pressed" when beta button is clicked.	**7**	**L3**	**CO3**
		OR			
Q.6	**a.**	What is JPanel class? Explain the constructors of Jpanel class and give a suitable example.	**6**	**L2**	**CO3**
	b.	What is JCheckBox class? Explain the constructors of JCheckBox class and give a suitable example.	**7**	**L2**	**CO3**
	c.	What is JFrame class? Explain constructors and methods of JFrame class.	**7**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the life cycle of servlet.	**6**	**L2**	**CO4**
	b.	Write a Java servlet program to display the name, USN and total marks by accepting student detail.	**7**	**L3**	**CO4**
	c.	Describe the core interfaces that are provided in Javax.Servlet.http package.	**7**	**L3**	**CO4**
		OR			
Q.8	**a.**	What is JSP? Explain the various types of JSP tags with example.	**10**	**L2**	**CO4**
	b.	What are cookies? How cookies are handled in JSP? Write a JSP program to create and read a cookie.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	What are database drivers? Explain the different JDBC driver types.	**10**	**L2**	**CO5**
	b.	Describe the various steps of JDBC with code snippets.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Write any two syntax of established a connection to a database.	**6**	**L2**	**CO5**
	b.	What is connection pooling? Explain connection pooling with a neat diagram with snippets.	**7**	**L2**	**CO5**
	c.	Describe the following concepts: i) Callable statement ii) Transaction processing.	**7**	**L2**	**CO5**

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BIC401

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Elements of Cyber Security and IoT

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain a basic firewalled network.	10	L2	CO1
	b.	Explain the role of each one of 7 layers in OSI model.	10	L2	CO1
		OR			
Q.2	a.	Write a note on Hub, Switch, Router.	10	L2	CO1
	b.	Explain the concept about collisions and broadcast domains.	04	L2	CO1
	c.	Explain the importance of IP addressing with an example.	06	L2	CO1
		Module – 2			
Q.3	a.	Explain about Pay-per click business model.	08	L2	CO2
	b.	Explain shell code execution in a stack buffer overflow.	06	L2	CO2
	c.	Write a note on Race Condition.	06	L2	CO2
		OR			
Q.4	a.	Explain the concept centralized botnet infrastructure.	08	L2	CO2
	b.	Explain the concept of Stack Based Buffer overflow.	06	L2	CO2
	c.	Write a note on SQL Injection.	06	L2	CO2
		Module – 3			
Q.5	a.	Explain the concept of A cross site scripting (XSS) worm spreads between twitter accounts via an XSS attack.	07	L2	CO3
	b.	Explain logic for an actor creating a virtual machine obfuscated binary.	07	L2	CO3
	c.	Explain the concept of viruses and malware.	06	L2	CO3
		OR			
Q.6	a.	Explain how System Service Descriptor Table (SSDT) resources kernel mode functions into addresses.	07	L2	CO3
	b.	Write different steps involved in spyware creators take to make money.	07	L2	CO3
	c.	Explain a visual representation of token kidnapping process.	06	L2	CO3

		Module – 4			
Q.7	**a.**	Explain the genesis of IoT with evolutionary phases of the internet.	**08**	**L2**	**CO4**
	b.	Explain the concept of convergence of IT and OT. Also compare Operational Technology (OT) and Information Technology (IT).	**07**	**L2**	**CO4**
	c.	Write a note on Micro Electro Mechanical System (MEMS).	**05**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain IoT impacts on various Technological aspects and Environment.	**08**	**L2**	**CO4**
	b.	Explain the concept of Sensor Network.	**07**	**L2**	**CO4**
	c.	Explain the different trends in Smart Objects.	**05**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the protocol stack 802.15.4 and also explain zigbee protocol stack, physical layer and MAC layer.	**12**	**L2**	**CO5**
	b.	Explain the concept of optimizing Internet Protocol for IoT.	**08**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain IoT application layer protocols and also write a note on COAP (Constrained Application Protocol).	**12**	**L2**	**CO5**
	b.	What is an unconstrained network? Explain IEEE 802.11 Wi-Fi with physical and MAC layer.	**08**	**L2**	**CO5**

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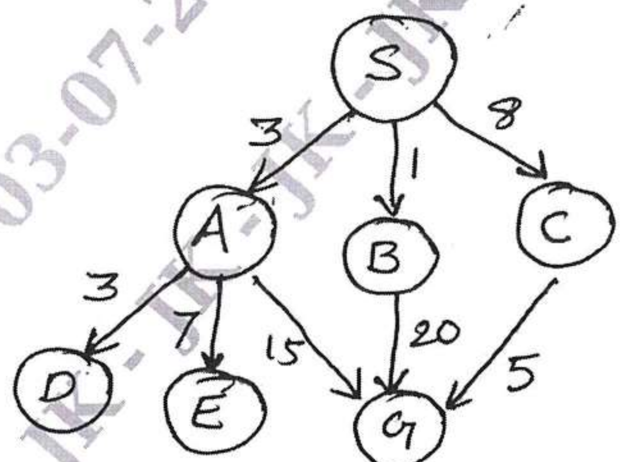
BAD402

Fourth Semester B.E/B.Tech. Degree Examination, June/July 2025
Artificial Intelligence

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
1	a.	What are the four components to define a problem? Define them.	4	L1	CO1
	b.	Compare and contrast human intelligence to artificial intelligence with numerous examples and applications.	7	L4	CO1
	c.	Explain the following : i) PEAS ii) Simple reflex agent iii) Model based agent.	9	L2	CO1
		OR			
2	a.	What is AI? List out the applications of AI, state the characteristics of AI problem.	8	L1	CO1
	b.	Analyse and generalize what is a rational agent.	6	L4	CO1
	c.	Explain the structure of agents and analyse the characteristics of intelligent agents.	6	L2	CO1
		Module – 2			
3	a.	You are given two jugs, a 5 liters one and a 4 liters one, A pump which has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can you get exactly 2 (two) liters of water in the 5(five) liters of jug? Unit : Apply water Jug problem algorithm.	10	L3	CO2
	b.	Describe Depth First Search (DFS) search algorithm with an example.	10	L2	CO2
		OR			
4	a.	Explain Breadth First Search (BFS) algorithm and apply BFS to find the solution for the above graph. Also find the optimum path and cost for the above graph.  Fig.Q4(a)	10	L3	CO2
	b.	Describe the iterative deepening depth first search with an example.	10	L2	CO2

		Module – 3			
5	a.	Compare blind search and heuristic search algorithm in detail.	6	L4	CO3
	b.	Write a note on Wumpus world problem.	6	L2	CO3
	c.	Write the connectives used to form complex sentence of propositional logic. Given example for each.	8	L2	CO3
		OR			
6	a.	Describe A* search algorithm with an example.	10	L3	CO3
	b.	Compare proposition logic and predicate logic in detail with example.	4	L4	CO3
	c.	Explain the following concepts with example : i) Heuristic function ii) Atomic sentence iii) Complex sentence.	6	L2	CO3
		Module – 4			
7	a.	What are predicates? Explain its syntax and semantics.	5	L2	CO4
	b.	Define universal and existential instantiation and give example for both.	5	L1	CO4
	c.	Consider the following knowledge base : i) Gita likes all kinds of food ii) Mango and chapatti and food iii) Gita eats almond and is still alive iv) Anything eaten by anyone and is still alive is food Goal : Gita likes almond.	10	L3	CO4
		OR			
8	a.	Write appropriate quantifiers for the following : i) Some students read well ii) Some students like some books iii) Some students like all books iv) All students like some books v) All students like no books Explain the concept of resolution in first order logic with appropriate procedure.	8	L3	CO4
	b.	Write and explain simple backward – chaining algorithm and forward – chaining algorithm for first – order knowledge bases with example. Also, explain the process of unification.	12	L3	CO4
		Module – 5			
9	a.	Explain the impact of uncertainty in probabilistic reasoning.	5	L2	CO5
	b.	Explain Bayes' rule and its utilization in probabilistic reasoning.	5	L2	CO5
	c.	Write the representation of Bayes Theorem. In a class, 70% children were fall sick due to viral fever and 30% due to bacterial fever. The probability of observing temperature for viral is 0.78 and bacterial is 0.31. If a child develops high.	10	L3	CO5
		OR			
10	a.	Write short notes on : i) Expert systems ii) Knowledge acquisition.	8	L2	CO5
	b.	Suppose a doctor is trying to find out if a patient is suffering from some type of cancer. If the cancer is only found on average in 2 out of every, 1000 people, the doctor's initial beliefs can be expressed as P(cancer) = 0.002. There is a laboratory test to determine if the patient has cancer. Unfortunately this test is 100 % accurate. The test comes back positive in 98% of cases where the patient has cancer. Also, the test comes out negative only in 97% of the cases, where the patient does not have a cancer. If the doctor orders a test, and it comes back positive what is the probability that the patient indeed has cancer?	12	L3	CO5

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BCS501

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
Software Engineering & Project Management

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the software process in software engineering highlighting the importance of software engineering.	10	L2	CO1
	b.	Explain the five activities that a generic process framework for software engineering encompasses.	10	L2	CO1
		OR			
Q.2	a.	Explain software myths with examples.	10	L2	CO1
	b.	Explain Incremental process models and evolutionary process models with a neat diagram.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the different tasks which requirements engineering encompasses.	10	L2	CO2
	b.	Explain the nature and characteristics of software system.	10	L2	CO2
		OR			
Q.4	a.	Explain requirements elicitation and various techniques used in requirements elicitation along with its importance.	10	L2	CO2
	b.	Illustrate an UML use case diagram for home security function.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain Agile process and agility principles.	10	L2	CO3
	b.	Explain Extreme Programming (XP) with a neat diagram.	10	L2	CO3
		OR			
Q.6	a.	Explain SCRUM process with a neat diagram.	10	L2	CO3
	b.	Explain Agility with the cost of change with diagram. Explain the principles of Agile software development.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain different categories of software projects with example.	10	L2	CO4
	b.	Compare between Project Management Life Cycle And Software Development Life Cycle and its phases.	10	L2	CO4
		OR			
Q.8	a.	Explain the difference between traditional and modern project management.	10	L2	CO4
	b.	Explain the concepts in activity planning in software project management.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain place of software quality in project management.	10	L2	CO5
	b.	Explain in detail the techniques to enhance software quality.	10	L1	CO5
		OR			
Q.10	a.	Explain Quality Management Systems. With principles of BSENISO9001 : 2000.	10	L2	CO5
	b.	Explain the techniques to enhance software quality and software reliability. Explain SEICMM levels.	10	L2	CO5

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BCS502

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
Computer Networks

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Data Communications. Explain the characteristics and components of Data communication with neat diagram.	10	L2	CO1
	b.	With neat diagram explain the Layers in the TCP /IP protocol suite.	10	L2	CO1
		OR			
Q.2	a.	Explain in detail the guided and unguided Media transmission with suitable diagram.	12	L2	CO1
	b.	Describe the working of Datagram network with suitable sketches	08	L2	CO1
		Module – 2			
Q.3	a.	With a neat sketch describe the working of simple protocol of Data Link Layer. Develop a program to implement a sliding window protocol in the data link layer.	12	L2	CO2
	b.	Illustrate the stop and wait protocol of DLL with an example.	08	L2	CO2
		OR			
Q.4	a.	Solve : i) In parity check if the dataword is 1011. What is the code word? What happens at receiver, if the receive word is a) 10011 b) 10110 c)01011 ii) Generate CRC for the dataword $x^3 + 1$ and the generator $x^3 + x + 1$. What happens if the received word is 1000110. iii) Generate checksum of list of five 4-bit number (7,11,12,0,6) and verify the same at receiver.	12	L3	CO2
	b.	Illustrate the working of CSMA/CA with a flow diagram	08	L2	CO2
		Module – 3			
Q.5	a.	Summarize the packet format of IPV6 datagram with suitable diagram.	10	L2	CO2
	b.	Develop an algorithm for Distance Vector Routing and explain the same.	10	L2	CO4
		OR			
Q.6	a.	Explain MOSPF with an example and suitable diagram.	10	L3	CO4
	b.	Develop algorithm for Link state Routing and explain the same.	10	L2	CO4
		Module – 4			
Q.7	a.	Illustrate the working of Go-back-N protocol with an example	12	L2	CO4
	b.	Explain connectionless aand connection oriented services in Transport layer.	08	L2	CO2
		OR			
Q.8	a.	Illustrate the connection establishment and termination in TCP/IP with suitable sketches.	12	L2	CO3
	b.	With sketch of TCP segment format, describe its field.	08	L2	CO3
		Module – 5			
Q.9	a.	Explain FTP and its two connections.	10	L2	CO3
	b.	Explain SMTP with diagram and the mail transfer phases.	10	L2	CO3
		OR			
Q.10	a.	Explain MIME and its header.	10	L2	CO3
	b.	Explain SSH and its components with neat diagram.	10	L2	CO3

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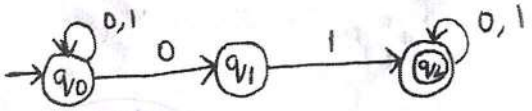
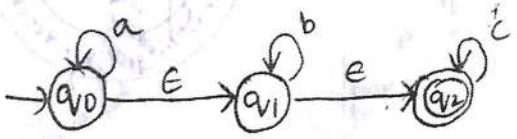
BCS503

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
Theory of Computation

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define the following with an example: i) Alphabet ii) Power of an alphabet iii) String iv) String concatenation v) Language	5	L1	CO1
	b.	Define Deterministic Finite Automata (DFA) and the language accepted by it.	5	L1	CO1
	c.	Design DFA to accept the following languages: i) $L = \{W \in \{0, 1\}^* : W \text{ has } 001 \text{ as a substring}\}$ ii) $L = \{W \in \{0, 1\}^* : \lvert W \rvert \bmod 3 = 0\}$	10	L3	CO1
		OR			
Q.2	a.	Convert the following NFA to DFA  Fig.Q.2(a)	8	L2	CO1
	b.	Convert the following $\in$ - NFA to DFA  Fig.Q.2(b) and define $\in$ - NFA	12	L2	CO1
		Module – 2			
Q.3	a.	Define regular expression. Write the regular expression for the following languages: i) Representing for strings of a and b's having odd length. ii) To accept 10 as substring over an alphabet $\Sigma = \{0, 1\}$	10	L2	CO2
	b.	State and prove pumping Lemma for regular languages.	10	L2	CO2

		OR			
Q.4	**a.**	Prove that regular languages are closed under complementation and intersection.	**10**	**L2**	**CO2**
	b.	i) Obtain NFA (Non deterministic finite automata) for the regular expression $(a + b)^* abb$. ii) Obtain NFA for the regular expression $(a^* + ab)(a + b)^*$	**6**	**L2**	**CO2**
	c.	Write the applications of regular expression.	**4**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Define context free grammar. Write the CFG for the following languages: i) $L = \left\{ a^n b^n c^m : \begin{matrix} n \geq 0 \\ m >= 0 \end{matrix} \right\}$ ii) $L = \{w \in \{a, b\}^* : n_a(w) = n_b(w)\}$	**10**	**L2**	**CO2**
	b.	i) Define ambigious grammar with suitable example. ii) Consider the grammar $E \rightarrow + EE / * EE / - EE / x / y$ Find the left most derivation, right most derivation and parse tree for the string "+* -xyxy".	**10**	**L2**	**CO2**
		OR			
Q.6	**a.**	Define PDA (Push Down Automata). Design a PDA to accept the following language: $L = \{a^n b^n : n \geq 0\}$. Draw the transition diagram and show that instantaneous description for the string aaabbb.	**10**	**L3**	**CO3**
	b.	Convert the following CFG to PDA: i) $E \rightarrow E + E \mid E * E \mid id$ ii) $E \rightarrow I \mid E * E \mid (E)$ $I \rightarrow id$	**6**	**L2**	**CO3**
	c.	Discuss the language accepted by PDA.	**4**	**L1**	**CO3**
		Module – 4			
Q.7	**a.**	Convert the following grammar to CNF (Chomsky Normal Form) $S \rightarrow ASB / \in$ $A \rightarrow aAS / a$ $B \rightarrow SbS \mid A \mid bb$ and define CNF	**10**	**L2**	**CO3**
	b.	State and prove pumping Lemma for context free languages.	**10**	**L2**	**CO3**

		OR			
Q.8	**a.**	What are useless and $\in$ productions? Eliminate $\in$, unit and useless productions from the following grammar: $A \rightarrow bA / Bba / aa$ $B \rightarrow aBa / b / D$ $C \rightarrow CA / AC / B$ $D \rightarrow a / \in$	**10**	**L3**	**CO3**
	b.	Prove that the family of context free languages is closed under union concatenation and star closure.	**10**	**L2**	**CO3**
		Module – 5			
Q.9	**a.**	Define a Turing Machine. Explain the working and variants of Turing machine.	**10**	**L1**	**CO4**
	b.	Design a Turing machine to accept $L = \{a^n b^n c^n \mid n \geq 0\}$. Draw the transition diagram. Show the moves mode for string aabbcc.	**10**	**L3**	**CO4**
		OR			
Q.10	**a.**	Explain language acceptability and design of Turing Machines (Steps).	**10**	**L2**	**CO5**
	b.	Explain the following: i) Programming techniques for turing machines ii) Undecidability problem.	**10**	**L2**	**CO5**

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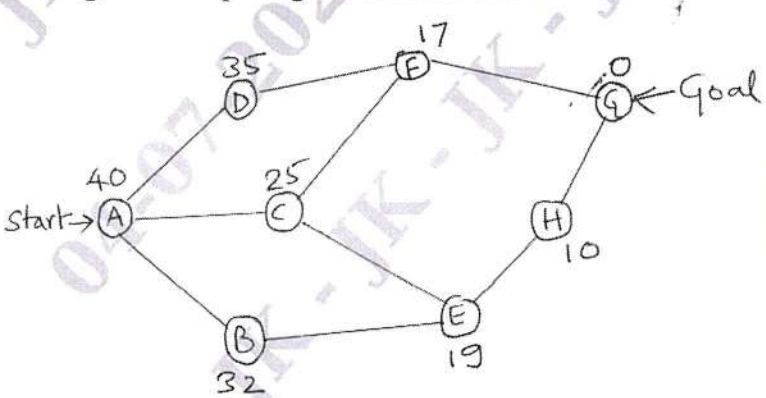
BCS515B

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
Artificial Intelligence

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is Artificial Intelligence? Explain the four approaches of Artificial Intelligence in detail	10	L2	CO1
	b.	What Artificial Intelligence can do today? Explain various application domains of Artificial Intelligence.	10	L2	CO1
		OR			
Q.2	a.	With the help of a block diagram, explain how agents interact with task environments.	05	L2	CO1
	b.	Briefly explain the properties of task environments.	07	L2	CO1
	c.	With a neat diagram explain the following : i) Utility based agents ii) Learning agents	08	L2	CO1
		Module – 2			
Q.3	a.	List and define the four phases of problem – solving process.	05	L3	CO2
	b.	Explain how a search problem can be formally defined. Illustrate the same for the Vacuum world problem.	10	L2	CO2
	c.	Write the state-space graph for the two-cell vacuum world problem.	05	L3	CO2
		OR			
Q.4	a.	Illustrate Breadth-first search and Depth-first search strategies with suitable example.	10	L3	CO2
	b.	Explain the different metrics used to evaluate an algorithms performance.	06	L2	CO2
	c.	List and explain the three kind of queues used in Best –first search method.	04	L2	CO2
		Module – 3			
Q.5	a.	Apply Greedy best-first search algorithm to the following graph and show the various stages in computing the solution tree.	10	L3	CO3
		 Fig. Q.5 (a)			
	b.	Explain different methods of deriving heuristics.	10	L2	CO3
		OR			
Q.6	a.	Using PEAS description, represent the Wumpus World problem.	06	L3	CO3
	b.	Briefly explain Knowledge Based Agents.	04	L2	CO3
	c.	Explain in detail, syntax and semantics of propositional logic.	10	L3	CO3

		Module – 4			
Q.7	**a.**	Explain in detail, syntax of first order logic.	**10**	**L2**	**CO4**
	b.	Explain various steps in the knowledge engineering process.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Write Unification algorithm. Explain with suitable example.	**10**	**L2**	**CO4**
	b.	Explain simple forward – chaining algorithm with an example.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain Backward – chaining algorithm with an example.	**10**	**L2**	**CO5**
	b.	Illustrate the procedure to convert a sentence of first order logic to Conjunctive Normal Form (CNF)	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Illustrate categories and objects with suitable examples.	**10**	**L2**	**CO5**
	b.	Explain the following with respect to events: i) Time ii) Fluents and objects	**10**	**L2**	**CO5**

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BCS601

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025
Cloud Computing

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain critical cluster design issues and feasible implementation.	8	L2	CO2
	b.	Describe VM primitive operations.	6	L2	CO2
	c.	Explain virtual machine with architectures of compared with traditional physical machine.	6	L2	CO1
		OR			
Q.2	a.	Explain the following: i) . Internet of thing ii) Cyber physical systems iii) Memory storage and wide area networking	 2 2 6	L1	CO1
	b.	Explain computing paradigm distinctions.	5	L2	CO2
	c.	Describe the classification of parallel and distributed computing systems.	5	L2	CO2
		Module – 2			
Q.3	a.	Explain implementation levels of virtualization.	5	L2	CO2
	b.	Draw architecture of computer before and after virtualization.	5	L3	CO2
	c.	Explain how virtualization support at OS level.	10	L3	CO2
		OR			
Q.4	a.	Explain virtualization of CPU/memory and I/O devices.	10	L2	CO3
	b.	Describe virtualization for data center automation.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain cloud service models with the diagram.	5	L2	CO2
	b.	Explain cloud deployment models.	5	L2	CO2
	c.	Write a note on public cloud platforms, GAE, AWS and Azure.	10	L2	CO3

		OR			
Q.6	**a.**	Define cloud computing and list the characteristics.	**5**	**L1**	**CO1**
	b.	Write benefits and challenges of each service.	**5**	**L1**	**CO1**
	c.	Write a note on Inter cloud resource management.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Summarize cloud data encryption and challenges in data encryption.	**8**	**L2**	**CO1**
	b.	Write a note on cloud security define strategies.	**6**	**L2**	**CO1**
	c.	Explain anomaly detection techniques in cloud.	**6**	**L3**	**CO3**
		OR			
Q.8	**a.**	Describe data and software protection techniques.	**8**	**L2**	**CO2**
	b.	Briefly explain reputation-guided protection of data centers.	**6**	**L2**	**CO1**
	c.	Explain access control and identity access management.	**6**	**L1**	**CO2**
		Module – 5			
Q.9	**a.**	Write difference between cloud and grid computing.	**6**	**L1**	**CO2**
	b.	Explain the following : i) Server keys computing ii) Edge computing iii) AI/ML in cloud iv) Containerization with Docker and Kubernetes v) Quantum computing in cloud	**10**	**L2**	**CO2**
	c.	Explain AWS services.	**4**	**L2**	**CO2**
		OR			
Q.10	**a.**	Explain the features of cloud and grid computing.	**10**	**L1**	**CO2**
	b.	Distinguish between AWS, Azure, GCP, IBM cloud.	**6**	**L3**	**CO3**
	c.	List out best practices for cloud software development.	**4**	**L3**	**CO3**

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BCS613B

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025
Computer Vision

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define computer vision. Explain in detail the applications of computer vision.	10	L1,2	CO1
	b.	Explain bidirectional reflectance distribution function (BRDF) along with diffusion and specular reflection.	10	L2	CO1
		OR			
Q.2	a.	With neat diagram explain the working digital camera.	10	L2	CO1
	b.	Explain the basic steps of image processing with block diagram.	10	L1,2	CO1
		Module – 2			
Q.3	a.	Explain 2D and 3D transforms with basic 2D planar transformation diagram.	10	L2	CO2
	b.	Discuss the operation of Fourier transformer to analyze the frequency characteristics of various filters with its properties.	10	L3	CO2
		OR			
Q.4	a.	Explain more neighborhood operators in digital image processing.	10	L2	CO2
	b.	Explain in detail pyramids and Wavelets.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain in detail amodel of Image degradation / restoration process.	10	L2	CO3
	b.	Explain in detail print, line, edge detection and thresholding.	10	L2	CO3
		OR			
Q.6	a.	Explain in detail periodic noise reduction by frequency domain filtering.	10	L3	CO3
	b.	Explain Image Segmentation by region growing and region splitting and merging.	10	L2	CO2
		Module – 4			
Q.7	a.	Explain different color models used in image processing. Compare RGB and HSV models.	10	L2	CO4
	b.	Explain in detail color transformations.	10	L2	CO4
		OR			
Q.8	a.	Explain color image smoothing and sharpening.	10	L2	CO4
	b.	Summarize color in image segmentation and noise in color images.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain in detail different morphological image processing operations.	10	L2	CO5
	b.	Explain in detail feature extraction with Boundary processing.	10	L3	CO5
		OR			
Q.10	a.	Explain different morphological algorithms.	10	L3	CO5
	b.	Explain in detail Image Pattern classification by prototype matching.	10	L3	CO5

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BIS601

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025
Full Stack Development

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the difference between var, let and const with suitable examples.	5	L2	CO1
	b.	Describe the various data types in JavaScript. Give examples for each.	5	L2	CO1
	c.	Write a program that creates an array of 5 cities and performs the following: i) Adds a city at the end ii) Removes the first city iii) Logs the total numbers of cities iv) Finds the index of a special city v) Search for a specific city vi) Replace specific city with another	10	L3	CO1
		OR			
Q.2	a.	Create a JavaScript object named student with properties: name, grade and subjects. Add a method displayInfo( ) to log student details.	5	L3	CO1
	b.	Explain the structure of a JavaScript function. How are parameters and return values used?	5	L2	CO1
	c.	Explain the usage of at least five different string methods in JavaScript with help of suitable code snippets.	10	L2	CO1
		Module – 2			
Q.3	a.	What is the Document Object Model (DOM)? Explain its significance in web development.	5	L2	CO2
	b.	Explain event delegation and how it helps improve performance in DOM manipulation.	5	L2	CO2
	c.	Explain any six different DOM method used to access or manipulate HTML elements in JavaScript, including their syntax, use cases and when each in preferred.	10	L2	CO2
		OR			
Q.4	a.	How can you select HTML elements using JavaScript? List and explain at least three methods.	5	L2	CO2
	b.	What are event listeners in JavaScript? How do they differ from traditional event attributes (like onclick) for binding events?	5	L2	CO2

	c.	Create a button in your HTML with the text "Click Mc". Add an event listener to log "Button clicked!", to the console when the button is clicked. Select on image and add a mouseover event listener to change its border color. Add on event listener to the document that logs the key pressed by the user.	10	L3	CO2
		Module – 3			
Q.5	a.	Explain the components of the MERN stack and discuss how they interact in a full stack application. Highlight the role of each component with examples.	10	L2	CO3
	b.	Describe how to implement a simple REST API using express to return a list of issues. Include an explanation of routing, request handling and how JSON data is sent as a response.	10	L3	CO3
		OR			
Q.6	a.	Discuss how react uses JSX for rendering UI components. What are the benefits of using JSX over plain JavaScript in react applications?	10	L3	CO3
	b.	Describe the steps involved in creating a react components using ES6 class syntax. What are the essential life cycle methods used in such a component?	10	L3	CO3
		Module – 4			
Q.7	a.	Explain how state is initialized and update in a react class component. Illustrate with an example from the issue tracker application.	10	L2	CO4
	b.	Discuss how event handling is implemented in react. How does it differ from traditional DOM event handling in vanilla JavaScript?	10	L3	CO4
		OR			
Q.8	a.	Differentiate between stateless and stateful components in react. When should each be used in a component – based architecture?	10	L2	CO4
	b.	Write a react class component that displays a button and a counter. Each time the button is clicked, increase the count and display it. Use constructor to initialize state and setstate( ) to update it.	10	L3	CO4
		Module – 5			
Q.9	a.	Discuss the key differences between insert, update and find operations in MongoDB. How does MongoDB handle flexible schema and embedded documents?	10	L2	CO5
	b.	Create a simple webpack. config.js file that: i) Bundles on entry point file App.jsx ii) Uses babel – loader to transpile JSX iii) Outputs app. bundle.js in a static directory. iv) Uses ES6 presets for react.	10	L3	CO5

		OR			
Q.10	**a.**	Write Mongo shell commands to perform the following operations: • Insert three employee documents with different fields. • Update one document to add a middle name. • Delete one document by-id • Create an index on the age field • Query employees whose age is greater than 30.	**10**	**L3**	**CO5**
	b.	Explain the purpose of using webpack in a full stack project. Describe how webpack helps in modularization and bundling.	**10**	**L2**	**CO5**

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BIS613D

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025
Cloud Computing and Security

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Describe the vision introduced by cloud computing?	06	L2	CO1
	b.	Provide brief characteristics of distributed system with examples?	06	L3	CO1
	c.	What is the major revoluation introduced by web 2.0?	08	L2	CO1
		OR			
Q.2	a.	Describe the main characteristic of service orientation of cloud computing with examples.	06	L3	CO1
	b.	What is the major distributed computing technology that led to cloud computing.	06	L2	CO1
	c.	Briefly summarize the challenges still open in cloud computing.	08	L1	CO1
		Module – 2			
Q.3	a.	What is Xen? Discuss its elements for virtualization.	06	L2	CO2
	b.	Discuss the reference module of full virtualization.	06	L3	CO2
	c.	List and discuss different types of virtualization.	08	L2	CO2
		OR			
Q.4	a.	How is cloud development different from traditional software development.	06	L2	CO2
	b.	Discuss the architecture of Hyper – V. Discuss its use in cloud computing.	06	L2	CO2
	c.	Discuss classification on taxonomy of visualization of different levels?	08	L3	CO2
		Module – 3			
Q.5	a.	Explain the three primary cloud service models; IaaS PaaS, and SaaS with examples.	06	L2	CO3
	b.	Differentiate between Public, Private and hybrid cloud with advantages and limitation.	06	L3	CO3
	c.	What is a warehouse – scale data center? How does it differ from modular data centers.	08	L2	CO3
		OR			
Q.6	a.	Compare the services and target applications of GAE, AWS and Microsoft Azure.	06	L3	CO3
	b.	Describe the fat-free topology and explain its use in data center network architecture.	06	L2	CO3
	c.	Explain the key requirements for an efficient cloud data center interconnection network.	08	L2	CO3

Module – 4					
Q.7	**a.**	What is a trusted Hypervisor? Explain the mobile devices face a range of security challenges?	**06**	**L2**	**CO4**
	b.	Discuss the Security Risks posed by shared images and management os?	**06**	**L2**	**CO4**
	c.	Describe the Hidden Risk in the cloud computing.	**08**	**L3**	**CO4**
OR					
Q.8	**a.**	Explain the best Top 5 Cloud Security Best practices.	**06**	**L2**	**CO4**
	b.	What are the most important advantages of cloud technology for social network.	**06**	**L2**	**CO4**
	c.	Describe the key features of Google?	**08**	**L2**	**CO4**
Module – 5					
Q.9	**a.**	What are the benefits and challenges of using server less computing in the cloud?	**06**	**L2**	**CO5**
	b.	How does grid computing differ from cloud computing.	**06**	**L2**	**CO5**
	c.	What are the key features of cloud computing platforms.	**08**	**L2**	**CO5**
OR					
Q.10	**a.**	How do multi cloud and hybrid cloud strategies differ.	**06**	**L2**	**CO5**
	b.	What is infrastructure as code (IaC) and how if it used in the cloud.	**06**	**L2**	**CO5**
	c.	What are emerging cloud environments.	**08**	**L2**	**CO5**

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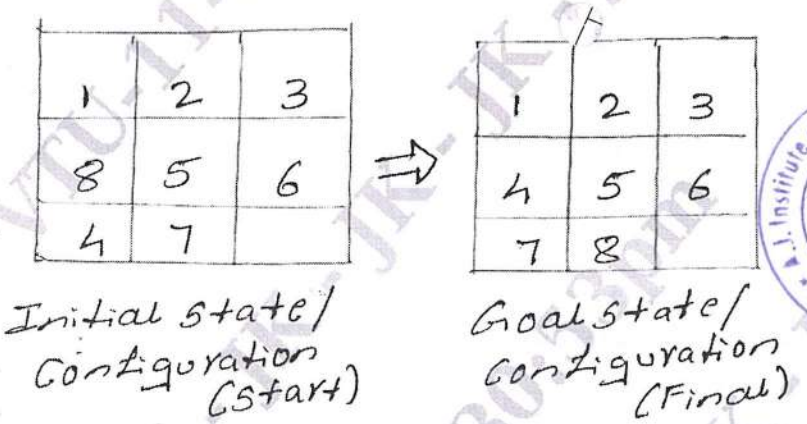
BAI654D

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025
Introduction to Artificial Intelligence

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define artificial intelligence, classify the task domains of artificial intelligence.	10	L2	CO1
	b.	Construct the state space tree and show one possible solution for the following given initial and goal state of the 8-puzzle problem : 	10	L3	CO1
		OR			
Q.2	a.	A water jug problem states "you are provided with two jugs, first one with 6-gallon capacity and the second one with 8-gallon capacity. Neither have any measuring markers on it". How can you get exactly half of water into 8-gallon jug? i) Write down the production rules for the above problem ii) Construct the state space tree with any one possible solution.	10	L4	CO1
	b.	Discuss the State of the Art with respect to AI.	2	L3	CO1
	c.	Explain in detail generate and Test algorithms.	8	L2	CO1
		Module – 2			
Q.3	a.	What are the components of first-order logic? Explain each with an example.	10	L2	CO2
	b.	Discuss the forward and backward chaining/reasoning algorithm in propositional logic.	10	L3	CO2
		OR			
Q.4	a.	Define the following with examples in respect of sentences in proposition logic, i) Logical equivalence ii) Validity or tautology iii) Satisfiability or contingency iv) Contradiction.	10	L1	CO2
	b.	Discuss the resolution in predicate logic algorithm. Write the example also.	10	L3	CO2

		Module – 3			
Q.5	**a.**	Define quantifier, explain the types of quantifiers with examples.	**10**	**L2**	**CO3**
	b.	What is logic programming? Explain with an appropriate example.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Look at the following sentences : i) Marcus was a man ii) Marcus was a Pompeian iii) Marcus was born in 040 AD iv) All men are mortal v) All Pompeian's died in 079 AD vi) No mortal lives for more than 150 years Convert them into predicate logic.	**10**	**L3**	**CO3**
	b.	What do you mean by uncertainty? Discuss briefly the approaches to deal with the same.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain Minmax search algorithm.	**10**	**L2**	**CO**
	b.	Explain Alpha Beta pruning Algorithm with example in AI.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Discuss the steps /phases of natural language processing with the advantages and disadvantages.	**10**	**L3**	**CO4**
	b.	Write Depth First Search Iterative Deepening Algorithm.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain various learning techniques with examples.	**10**	**L2**	**CO5**
	b.	Discuss inductive learning with an example.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	What is an expert system? List and explain various expert systems.	**10**	**L2**	**CO5**
	b.	What is an analogy? Explain deviational analogy.	**10**	**L2**	**CO5**

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CBCS SCHEME

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BCS302

Third Semester B.E/B.Tech. Degree Examination, Dec.2025/Jan.2026
Digital Design and Computer Organization

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
1	a.	Obtain the minimum expression for the POS expression : $F(A, B, C, D) = \pi M(0, 1, 5, 7, 9, 13, 15) + d(3, 10)$.	5	L2	CO1
	b.	Implement the following logic function in SOP form using NOR gates. $Y = A\overline{B} + B\overline{C} + ABC$.	5	L3	CO1
	c.	Identify the essential prime implicants of the following functions : $F(w, x, y, z) = (0, 1, 4, 5, 6, 7, 9, 11, 14, 15)$ $F(A, B, C, D) = (0, 2, 3, 5, 7, 8, 10, 11, 14, 15)$.	10	L3	CO1
		OR			
2	a.	Demonstrate the positive and negative logic using AND gate.	5	L2	CO1
	b.	Simplify the following Boolean functions using K-map : i) $F(P, Q, R, S) = \Sigma(0, 2, 5, 7, 8, 10, 13) + d(1, 4, 15)$ ii) $F(A,B,C,D) = (\overline{A}+B+C)(\overline{A}+\overline{C}+D)(\overline{B}+C+D)$.	10	L3	CO1
	c.	Explain Dataflow Modeling in verilogy with an example program.	5	L1	CO1
		Module – 2			
3	a.	Explain the difference between combinational and sequential circuits with their block diagrams and examples.	5	L2	CO2
	b.	Write the verilog program to implement full adder and full subtractor circuits.	7	L2	CO2
	c.	Describe and explain 4 bit adder with carry look ahead.	8	L3	CO2
		OR			
4	a.	Implement the Boolean function : $F(A, B, C, D) = \Sigma m(1, 3, 4, 11, 12, 13, 14, 15)$ using 8 : 1 MUX.	5	L3	CO2
	b.	What is encoder? Design 8 : 3 encoder circuits with logic diagram and truth table and also list its applications.	7	L3	CO2
	c.	What is Latch? Demonstrate the working of SR flip-flop and D Flip-flop and write the characteristics table and equations.	8	L3	CO2

		Module – 3			
5	a.	What do you mean by an addressing mode? Explain any 5 addressing modes.	**10**	**L2**	**CO3**
	b.	Describe the Big-endian and Little-endian address assignment.	**5**	**L1**	**CO3**
	c.	A program with 5000 machine instructions needs an average of 3 basic steps to execute one instruction. Find the performance of the computer having a clock speed of 500 KHz.	**5**	**L3**	**CO3**
		OR			
6	a.	Demonstrate the Branching operations using loop to add n numbers with block diagram.	**8**	**L3**	**CO3**
	b.	Show how below expression will be executed in one address and three address processor in accumulator organization. X = (A * B) + (C * D).	**7**	**L3**	**CO3**
	c.	What are Condition Code Flags? Mention the significance of the flag N, Z, V and C.	**5**	**L1**	**CO3**
		Module – 4			
7	a.	Explain memory mapped I/O and I/O interface for an input device with a diagram.	**10**	**L2**	**CO4**
	b.	Explain DMA with a neat diagram.	**10**	**L4**	**CO4**
		OR			
8	a.	Explain how to handle interrupt from multiple devices using daisy chain and priority scheme.	**10**	**L3**	**CO4**
	b.	Explain centralized and distributed Bus Arbitration approaches.	**10**	**L2**	**CO4**
		Module – 5			
9	a.	With a diagram, explain the single bus organization of the data path inside a processor.	**10**	**L2**	**CO5**
	b.	Describe the basic idea of instruction pipeline.	**10**	**L2**	**CO5**
		OR			
10	a.	Explain the process of fetching word from memory in processor.	**10**	**L4**	**CO5**
	b.	Explain the pipeline performance of a processor and pipeline stalls.	**10**	**L2**	**CO5**

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BCS303

Third Semester B.E/B.Tech. Degree Examination, Dec.2025/Jan.2026
Operating Systems

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
1	a.	Explain the various types of system calls with an example for each.	8	L2	CO1
	b.	Explain cloud computing its types and their services it offers.	8	L2	CO1
	c.	What is dual mode operation and what is the need of it?	4	L2	CO1
		OR			
2	a.	Explain the different architecture of OS starting from Simple Structure, Layered Structure, Micro Kernels, Modules and Hybrid Systems.	8	L4	CO1
	b.	Discuss the essential properties of the following types of systems : i. Time sharing system ii. Multi-programmed batch systems.	6 6	L2	CO1
		Module – 2			
3	a.	Explain Inter Process Communication.	6	L2	CO2
	b.	Discuss Multilevel Queue Scheduling Algorithm.	6	L4	CO2
	c.	Consider the set of 3 processes whose arrival time and burst time are given below. If the CPU scheduling policy is SRTF, calculate the average waiting time and average turnaround time.	8	L3	CO2

Process Id	Arrival Time	Burst Time
P1	0	9
P2	1	4
P3	2	9

OR

4	a.	Compare User Level Threads and Kernel Level threads.	4	L4	CO2
	b.	Illustrate with a neat sketch, Process States and Process Control Block (PCB).	8	L2	CO2
	c.	Consider the set of 6 processes whose arrival time and burst time are given below. If the CPU scheduling policy is Round Robin with time quantum = 3, calculate Average Waiting time and Turnaround time.	8	L3	CO2

Process ID	Arrival Time	Burst Time
P_1	5	5
P_2	4	6
P_3	3	7
P_4	1	9
P_5	2	2
P_6	6	3

Module – 3

5	a.	Discuss in detail the critical section problem and write the algorithm for producer consumer problem.	10	L2	CO3
	b.	Consider the following system using data structures in the Bankers Algorithm with resource type ABC Maximum instance present in the system A = 10, B = 5, C = 7. i. Calculate Need Matrix ii. Check whether system is safe or not.	10	L3	CO3

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P_0	0	1	0	7	5	3	3	3	2
P_1	2	0	0	3	2	2			
P_2	3	0	2	9	0	2			
P_3	2	1	1	2	2	2			
P_4	0	0	2	4	3	3			

OR

6	a.	Outline the solutions of Dinning –Philosopher problem.	5	L2	CO3
	b.	Describe a resource allocation graph with an example.	5	L4	CO3
	c.	Using Bankers algorithm, solve the following problem : i. Calculate the Need Matrix ii. Check whether system is safe or not.	10	L2	CO3

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	0	0	1	2	0	0	1	2	1	5	2	0
P_1	1	0	0	0	1	7	5	0				
P_2	1	3	5	4	2	3	5	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

		Module – 4			
7	a.	Discuss the given memory management technique with diagram. i. Paging ii. Translation Look-Aside Buffer.	6 6	L2	CO4
	b.	Discuss about Contiguous Memory Allocation with a neat diagram.	8	L2	CO4
		OR			
8	a.	Consider the reference string : 6, 1, 1, 2, 0, 3, 4, 6, 0, 2, 1, 2, 1, 2, 0, 3, 2, 1, 2, 0 For a memory with three frames and calculate number of page faults by using i. LRU replacement ii. FIFO replacement.	10	L3	CO4
	b.	Describe the process of demand paging in OS.	10	L2	CO4
		Module – 5			
9	a.	Explain in detail about directory and disc structure.	6	L2	CO5
	b.	Analyze the file system implementation.	6	L4	CO5
	c.	The requested tracks, in the order received are {176, 79, 34, 60, 92, 11, 41, 114} Apply the following disk scheduling algorithms starting track at 50. i) FCFS ii) SSTF. Calculate the total seek time.	8	L3	CO5
		OR			
10	a.	Explain Free Space Management with an example.	6	L2	CO2
	b.	Explain the Access Matrix method of system protection with the domain as objects and its implementation.	6	L2	CO2
	c.	The requested tracks, the order received are {176, 79, 34, 60, 92, 11, 41, 114} Apply the following disk scheduling algorithms starting track at 50. i) Look ii) C – Look. Calculate the total seek time.	8	L3	CO3

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CBCS SCHEME

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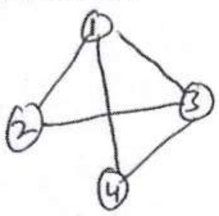
BCS304

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Data Structures and Applications

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Data Structure. Explain with neat diagram different types of data structure with examples. What are the primitive operations that can be performed?	10	L2	CO1
	b.	Define structure and union? Explain how they are different from each other, with suitable example.	5	L2	CO1
	c.	What do you mean by pattern matching? Outline Kruth, pattern matching algorithm.	5	L2	CO1
		OR			
Q.2	a.	Define stack. Give the implementation of push ( ) POP ( ) and Display ( ) functions by considering its empty and full conditions.	7	L2	CO1
	b.	Write an algorithm to evaluate a postfix expression and apply the same for the given postfix expression 6, 2, 13, -4, 2,×,+	7	L3	CO1
	c.	Write the postfix form of the following using stack, (i) $A*(B*C+D*E)+F$ (ii) $(A+(B*C)/(D-E))$	6	L3	CO1
		Module – 2			
Q.3	a.	What are the disadvantages of ordinary queue? Discuss the implementation of circular queue.	8	L2	CO2
	b.	Write a note on multiple stacks and priority queue.	6	L2	CO2
	c.	Define Queue. Discuss how to represent Queue using dynamic arrays.	6	L2	CO2
		OR			
Q.4	a.	What are Linked list? Explain the different types of Linked List with neat diagram.	4	L2	CO2
	b.	Give the structure definition for Singly Linked List (SSL). Write a C function to, (i) Insert an element at the end of SSL. (ii) Delete at node at the end of SSL.	8	L3	CO2

	c.	Write a C function to add two polynomials show the Linked List representation of below two polynomials $p(x) = 3x^{14} + 2x^7 + 1$ $q(x) = 8x^{14} + 5x^5 + 3x^2 + 2$	8	L3	CO2
		Module – 3			
Q.5	a.	Write a C-function for the following operation on doubly Linked List (DLL) : (i) Addition of a DLL node. (ii) Concatenation of two DLL.	8	L3	CO3
	b.	Write a C-function for the following operations on circular Linked List (i) Inserting at the front of a List. (ii) Find the number of nodes in circular list.	8	L3	CO3
	c.	Represent the given Sparse matrix using linked list representation. $A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 4 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 7 & 0 & 1 & 1 \\ 0 & 0 & 6 & 0 \end{bmatrix}$	4	L3	CO3
		OR			
Q.6	a.	Explain the different types binary tree representation with example.	8	L3	CO3
	b.	Define Threaded Binary tree. Discuss in threaded binary tree.	4	L3	CO3
	c.	Discuss Inorder, preorder, postorder and level order traversal with suitable recursive function for each.	8	L2	CO3
		Module – 4			
Q.7	a.	Write a function to perform the following operations on Binary Search Tree (BST) : (i) Inserting on element into BST. (ii) Recursive search of a BST.	8	L3	CO4
	b.	Discuss selection Trees with suitable example.	8	L2	CO4
	c.	Explain transforming a forest into a binary tree with an example.	4	L2	CO4
		OR			
Q.8	a.	Define graph. Show the adjacency matrix and adjacency. List representation of the graph given below.  Fig. Q8 (a)	6	L3	CO4

	b.	Define the following Terminologies with examples : (i) Vertex (node) (ii) Self loop (iii) Weighted graph (iv) Parallel edges	7	L1	CO4
	c.	Explain in detail elementary graph operations.	7	L1	CO4
		Module – 5			
Q.9	a.	What is collision? What are the methods to resolve collision? Explain linear probing with example.	8	L2	CO5
	b.	Explain in details about static and dynamic hashing.	6	L2	CO5
	c.	Discuss Leftist Trees with an example.	6	L2	CO5
		OR			
Q.10	a.	Explain different types of HASH functions with example.	6	L2	CO5
	b.	Discuss different types of rotations with suitable examples.	6	L3	CO5
	c.	Define Red-Black Tree, Splay tree. Discuss the method to insert an element into Red-Black tree.	8	L2	CO5

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CBCS SCHEME

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BCS306A

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Object Oriented Programming with Java

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain feature of Java.	7	L2	CO1
	b.	Define array, write a java program to calculate the average among the elements [8, 6, 2, 7].	7	L3	CO1
	c.	List and explain operators in JAVA with examples.	6	L2	CO1
		OR			
Q.2	a.	Explain OOP's features in java.	7	L2	CO1
	b.	Write a java program to sort the elements using a for loop.	7	L3	CO1
	c.	With example, explain different types of if statement in JAVA.	6	L2	CO1
		Module – 2			
Q.3	a.	Define Constructor. Explain two types of constructors with an example.	7	L3	CO2
	b.	Define Recursion. Write a recursive program to find factorial of a number.	7	L3	CO2
	c.	Explain garbage collection with an example, explain final and finalize ( ) method.	6	L2	CO2
		OR			
Q.4	a.	Define class. Explain call by value and call by reference with an example program.	7	L3	CO2
	b.	Using proper class and methods write a program to perform stack operations.	7	L3	CO2
	c.	Explain the use of this keyword in java with an example.	6	L2	CO2
		Module – 3			
Q.5	a.	Write a java program to implement multilevel inheritance with 3 levels of hierarchy.	7	L3	CO3
	b.	Define interface. With suitable program explain nested interface in java.	7	L3	CO3
	c.	Explain dynamic method dispatch with a suitable example.	6	L2	CO3

		OR			
Q.6	**a.**	Explain inheritance. Write a java program to implement single level inheritance.	**7**	**L3**	**CO3**
	b.	Explain the importance of the super key word in inheritance, illustrate with a suitable example.	**7**	**L3**	**CO3**
	c.	Define method overloading and overriding with example.	**6**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Define Package, with an example, explain the steps are involved in creating a user-defined package.	**7**	**L2**	**CO4**
	b.	With sample code, explain chained exception.	**7**	**L3**	**CO4**
	c.	Define an exception, with syntax explain all five keywords used in exception handling.	**6**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain the concept of package importing in java with an example.	**7**	**L2**	**CO4**
	b.	How do you create your own exception class, explain with a program.	**7**	**L2**	**CO4**
	c.	With an example, explain working of a nested try block within an exception.	**6**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Define Thread. With diagram explain the java thread model.	**7**	**L2**	**CO5**
	b.	Explain synchronization with an example, how synchronization is implemented in java.	**7**	**L3**	**CO5**
	c.	With suitable example, explain values( ) and valueOf( ) method in enumeration.	**6**	**L2**	**CO5**
		OR			
Q.10	**a.**	Define Multithreading, write a program to create multiple threads in java.	**7**	**L2**	**CO5**
	b.	Demonstrates the usage of compareTo( ) and equals( ) method with enumeration constants.	**7**	**L3**	**CO5**
	c.	Explain autoboxing / unboxing in expressions.	**6**	**L2**	**CO5**

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CBCS SCHEME

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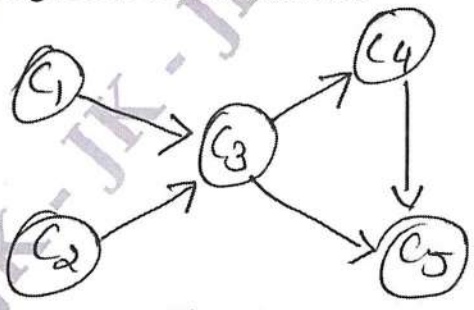
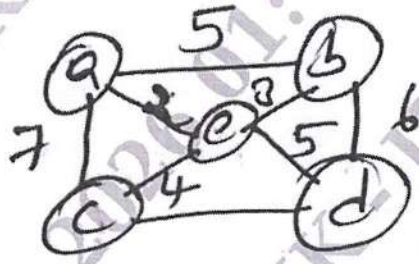
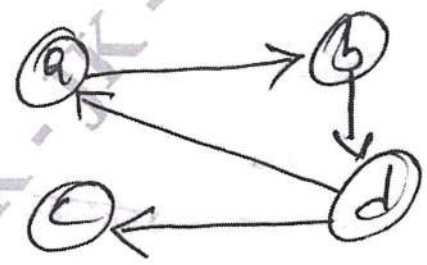
BCS401

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Analysis and Design of Algorithms

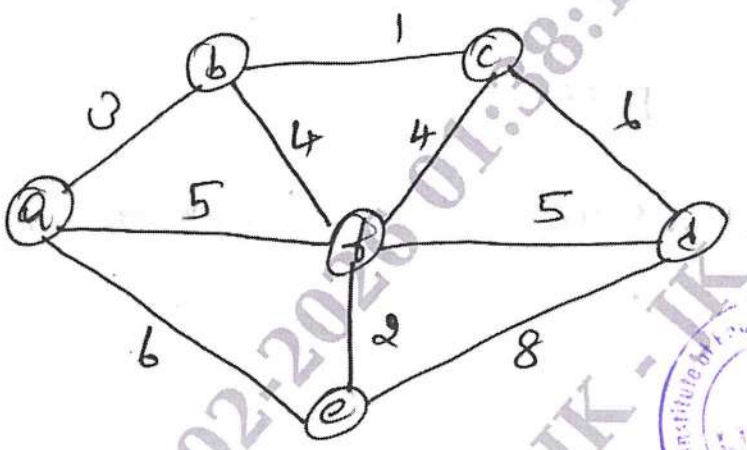
Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define algorithm with the help of flow chart, explain the various stages of algorithm's design and analysis process.	10	L2	CO1
	b.	Compare the order of 1/2 .n (n-1) and n^2.	4	L3	CO1
	c.	List and explain asymptotic notations used to compare the orders of growth of an algorithm, with an example each.	6	L3	CO1
		OR			
Q.2	a.	Give the general plan for analyzing the time efficiency of recursive algorithm show that efficiency of tower of Hanoi is exponential.	10	L2	CO1
	b.	Prove that if $t_1(n) \in 0(g_1(n))$ and $t_2(n) \in 0(g_2(n))$, then $t_1(n) + t_2(n) \in 0\{\max g_1(n), g_2(n)\}$.	4	L3	CO1
	c.	Solve the following recurrence $x(n) = x(n-1) + 5$ for $n > 1$, $x(1) = 0$	6	L3	CO1
		Module – 2			
Q.3	a.	Define Divide and Conquer. Design an algorithm for merge sort and sort the list "EXAMPLE" in alphabetical order using merge sort.	10	L3	CO2
	b.	Design an algorithm for quick sort. Sort the list 65, 70, 75, 80, 85, 60, 55, 50, 45. Also derive the worst case complexity of quick sort.	10	L3	CO2
		OR			
Q.4	a.	Define decrease and conquer technique. What are the three major variations of decrease and conquer technique? Obtain the topological ordering for the following graph. Using source removal method.  Fig.Q.4(a)	10	L3	CO2

	b.	Design an algorithm to sort N number of elements using insertion sort. Illustrate the tracing of insertion sort algorithm for the following set of numbers 25, 10, 72, 18, 40, 11, 64, 58, 32, 9.	10	L3	CO2
		Module – 3			
Q.5	a.	What is heap? Design an algorithm to construct a heap for the elements of the given array by bottom up approach. Show heap construction of the given list 2, 9, 7, 6, 5, 8 by successive insertion using bottom up procedure.	10	L2	CO3
	b.	What is AVL tree? Explain the four types of rotations used to construct the AVL tree. Construct AVL tree for the set 5, 6, 8, 3, 2, 4, 7 by successive insertion.	10	L3	CO3
		OR			
Q.6	a.	Apply Horse Pool's algorithm to search for the pattern DEMOCRATIC from the text INDIA_IS_A_DEMOCRATIC_COUNTRY. Explain its working along with a neat shift table and algorithm to find the pattern string.	10	L3	CO3
	b.	Design an algorithm for comparision counting sort. Apply the same to sort the list 62, 31, 84, 96, 19, 47.	10	L3	CO3
		Module – 4			
Q.7	a.	Apply Kruskal's algorithm to find minimum cost spanning tree to the graph shown below source = a ;  Fig.Q.7(a)	10	L3	CO4
	b.	Explain the Warshall's algorithm to find the transitive closure of a directed graph. Apply it to the following graph.  Fig.Q.7(b)	10	L3	CO4

OR

Q.8	**a.**	Construct a minimum cost spanning tree using prims algorithm for the following graph source = 'a'.  Fig.Q.8(a)	**10**	**L3**	**CO4**
	b.	What is Huffman Tree? Explain the algorithm to construct the Huffman tree. Construct the Huffman tree for the following data: Character: A, B, C, D, - Probability: 0.35, 0.1, 0.2, 0.2, 0.15	**10**	**L3**	**CO4**

Module – 5

Q.9	**a.**	Using Branch and Bound technique solve the below instance of knapsack problem. Item / Weight / Value: 1 / 2 / 12; 2 / 1 / 10; 3 / 3 / 20; 4 / 2 / 5 Capacity = 5	**10**	**L3**	**CO6**
	b.	Define Backtracking. Apply backtracking to solve the instance of the sum of subset problem s = {3, 5, 6, 7} and d = 15.	**10**	**L3**	**CO6**

OR

Q.10	**a.**	Explain the concept of P, NP, NP – complete and NP-Hard problem.	**10**	**L2**	**CO5**
	b.	What are Decision Trees? Explain with example, how decision trees are used in sorting algorithms.	**10**	**L2**	**CO6**

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CBCS SCHEME

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BIC401

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Elements of Cyber Security and IoT

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define the function of OSI model and explain all 7 layer specific roles.	10	L2	CO1
	b.	What is Router? What are the benefits of Routers and limitations of Router?	05	L2	CO1
	c.	What are the steps in finding the IP address of Default Gateway?	05	L2	CO1
		OR			
Q.2	a.	Explain the types of Default IP Address classes.	10	L2	CO1
	b.	What are Information Assurance Fundamentals? Explain in brief.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain any four fraud techniques in brief.	08	L2	CO2
	b.	Write a short note on DNs with suitable diagram.	05	L2	CO2
	c.	What are SQL Injection attacks? And how to protect against SQL Injection?	07	L2	CO2
		OR			
Q.4	a.	Explain Race conditions along with an example and diagram.	10	L2	CO2
	b.	Write a short note on Brute Force and Dictionary Attacks.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain DNS Amplification attacks with suitable diagram.	10	L2	CO3
	b.	Write a short note on virus.	10	L2	CO3
		OR			
Q.6	a.	Explain Virtual Machine Obfuscation.	10	L2	CO3
	b.	What is Man – in – the Middle Attacks?	10	L2	CO3
		Module – 4			
Q.7	a.	Explain smart connected buildings and digital ceiling with diagram.	08	L2	CO4
	b.	Explain IoT challenges.	05	L2	CO4
	c.	Write a short note on Genesis of IoT.	07	L2	CO4
		OR			
Q.8	a.	Explain Sensor Types with example.	10	L2	CO4
	b.	What are sensor networks? Explain WSNs.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain ZigBee and ZigBee IP protocol stack in IEEE802.15.4?	08	L2	CO5
	b.	Explain Header compression, fragmentation and mesh addressing with suitable diagram.	12	L2	CO5
		OR			
Q.10	a.	Compare CoAP & MQTT.	04	L2	CO5
	b.	Write a short note on Transport layer.	08	L2	CO5
	c.	Explain IEEE 1901.2a with suitable diagrams required.	08	L2	CO5

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CBCS SCHEME

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BCS402

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Microcontrollers

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Mention the difference between : i) Microprocessor and Microcontroller ii) CISC and RISC architectures	8	L2	CO1
	b.	With a neat diagram, explain ARM core dataflow model.	6	L2	CO1
	c.	With a neat diagram, explain embedded system hardware.	6	L2	CO1
		OR			
Q.2	a.	Explain the various modes of operation of ARM processor and banked registers.	8	L2	CO1
	b.	What is a pipeline? With neat diagram explain the various blocks in a 3-stage pipeline of ARM processor organization.	6	L2	CO1
	c.	Discuss the various fields in CPSR with neat sketch.	6	L2	CO1
		Module – 2			
Q.3	a.	With example illustrate how following instructions work. i) MLA ii) MUL iii) SMLAL iv) UMULL.	8	L3	CO2
	b.	Explain Single register load store addressing mode syntax, table index mode with an example.	8	L2	CO2
	c.	Explain Barrel shifter operation in ARM processor with neat diagram. If $r_5 = 5$, $r_7 = 8$ using the following instructions, write values of r_5, r_7 after execution of MOV r_7, r_5, LSL # 2.	4	L2	CO2
		OR			
Q.4	a.	Along with suitable examples describe various logical and comparison instructions.	8	L2	CO2
	b.	Discuss the Branch instructions and SWAP instructions with example.	8	L2	CO2
	c.	Explain briefly co-processor instructions of ARM processor.	4	L2	CO2
		Module – 3			
Q.5	a.	Explain basic C-Data types with example codes.	10	L2	CO3
	b.	Discuss how Registers are allocated to optimize the program.	10	L2	CO3

		OR			
Q.6	**a.**	Explain C looping structures with example codes.	**10**	**L2**	**CO3**
	b.	Explain function calls and pointer Aliasing with example codes.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	With a neat sketch, explain exceptions and associated modes.	**10**	**L2**	**CO4**
	b.	With the help of vector table, explain processor modes. Also mention the exception priority levels.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain interrupt latency, IRQ and FIQ exceptions in detail with neat sketches.	**10**	**L2**	**CO4**
	b.	Explain Firmware and bootloader, with sand stone example, explain detail directory layout.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	With neat diagram, explain the relationship of cache between processor core and main memory.	**8**	**L2**	**CO5**
	b.	With neat sketch, explain set associatively.	**8**	**L2**	**CO5**
	c.	Explain logical and physical cache with neat diagram.	**4**	**L2**	**CO5**
		OR			
Q.10	**a.**	Briefly, explain cache policies.	**8**	**L2**	**CO5**
	b.	Explain direct mapped cache and thrashing.	**8**	**L2**	**CO5**
	c.	Write short note on co-processor 15.	**4**	**L2**	**CO5**

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BAD402

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Artificial Intelligence

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define AI. Explain the foundation of AI in detail.	10	L2	CO1
	b.	Explain the historical development of AI, highlighting key milestones and breakthroughs.	10	L2	CO1
		OR			
Q.2	a.	Briefly explain the properties of Task Environment.	10	L2	CO1
	b.	Explain the following with respect to structure agents: (i) Simplex reflex (ii) Model based reflex (iii) Utility based	10	L2	CO1
		Module – 2			
Q.3	a.	Discuss how problem solving agents interact with their environments.	10	L2	CO2
	b.	Explain the principles of breadth-first search as a problem solving strategy with an example.	10	L2	CO2
		OR			
Q.4	a.	Discuss the different solutions and metrics for searching.	10	L2	CO2
	b.	Explain Goal Formulation and Problem Formulation with examples.	10	L2	CO2
		Module – 3			
Q.5	a.	Define informed search strategies in the context of AI. Difference between Informed and Uninformed search strategies.	10	L2	CO3
	b.	Explain A^* algorithm. Give one example where A^* is suitable is suitable to apply.	10	L2	CO3
		OR			
Q.6	a.	Describe the principles of greedy best first search as an informed search strategy. How does it make use of heuristic information?	10	L2	CO3
	b.	Explain the following with examples: (i) Logical Equivalence (ii) Inference Rules (iii) Horn Clauses	10	L2	CO3
		Module – 4			
Q.7	a.	Provide examples of how inference can be applied to draw conclusions in a given knowledge base represented FOL.	10	L2	CO4
	b.	Explain the propositional syntax and semantics of First Order Logic (FOL).	10	L2	CO4
		OR			
Q.8	a.	Describe the principles of forward chaining in FOL. Provide examples to illustrate how forward chaining works in practice.	10	L2	CO4
	b.	Outline the process of backward chaining in FOL. Provide examples to illustrate how forward chaining works in practice.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain the inference using full joint distribution.	10	L2	CO5
	b.	Explain Baye's rule and its use in detail.	10	L2	CO5
		OR			
Q.10	a.	Define Expert Systems. Explain the components of Expert System with a neat diagram. Also list its capabilities and incapabilities.	10	L2	CO5
	b.	Explain : (i) Knowledge Shell (ii) Knowledge Acquisition.	10	L2	CO5

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Fourth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Advanced Java

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Framework. List the need for a separate collection framework in Java and draw the hierarchy of the collection framework.	8	L1	CO1
	b.	Write the advantages of Java collections framework.	4	L1	CO1
	c.	Explain Hashset using Add( ) function, remove( ) function and size( ) function with programming example.	8	L2	CO1
		OR			
Q.2	a.	What is Collection Framework? List the methods defined by the collection interface.	8	L1	CO1
	b.	Name the constructors of the tree set class, and write a Java program to create a tree set collection.	6	L1	CO1
	c.	Explain any 2 legacy classes in Java's collection framework.	6	L2	CO1
		Module – 2			
Q.3	a.	Define string Handling and its class. Explain any three string constructors.	8	L1	CO2
	b.	Differentiate between equals( ) and = = with respect to string comparison.	6	L2	CO2
	c.	Explain any two character extraction methods of string class.	6	L2	CO2
		OR			
Q.4	a.	Explain the following methods of string Buffer class. i) append( ) ii) insert( ) iii) reverse( ) iv) replace( ).	10	L2	CO2
	b.	Demonstrate about the changing the case of characters with programming example.	6	L2	CO2
	c.	Define string buffer. Explain types of string buffer.	4	L2	CO2

Module – 3

Q.5	a.	Define Swing. Explain the origin of swing and motion the limitation of AWT.	6	L1	CO3
	b.	Explain swing packages in detail.	4	L2	CO3
	c.	Write a java program to create a simple swing application.	10	L3	CO3
		OR			
Q.6	a.	Compare java Awt and swing.	6	L2	CO3
	b.	Explain the following : i. Text controls ii. JTextarea iii. JTextfield iv. JPassword field.	4	L2	CO3
	c.	Write a suitable program using JFrame class, constructor and method.	10	L3	CO3

Module – 4

Q.7	a.	Construct the life cycle of servlets in detail.	10	L3	CO4
	b.	Write a Java servlet program to demonstrate how parameters are accessed from HTML.	10	L4	CO4
		OR			
Q.8	a.	List the different types of JSP tags with example.	10	L3	CO4
	b.	What is a Cookie? List out methods defined by cookie and write a java program to add a cookie.	10	L4	CO4

Module – 5

Q.9	a.	Write a program to execute a database transaction.	10	L4	CO5
	b.	Explain JDBC multitier architecture with neat diagram i.e drivers types in detail.	10	L3	CO5
		OR			
Q.10	a.	List the various steps of JDBC process with code snippets.	10	L4	CO5
	b.	Write a note on Database Metadata object methods and Resultset Metadat object methods.	10	L3	CO5

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BCS501

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Software Engineering and Project Management

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the domains of software applications.	08	L2	CO1
	b.	Outline the unique nature of WebApps.	08	L2	CO1
	c.	Explain various software myths. Discuss.	04	L2	CO1
		OR			
Q.2	a.	Explain the activities performed in a software process framework?	06	L2	CO1
	b.	Explain the waterfall model along with its pros and cons.	08	L2	CO1
	c.	Explain specialized process models.	06	L2	CO1
		Module – 2			
Q.3	a.	Explain how groundwork parameters are established in requirements engineering.	08	L2	CO2
	b.	What is the importance of quality function deployment in eliciting requirements?	06	L1	CO2
	c.	How can we validate requirements?	06	L1	CO2
		OR			
Q.4	a.	Explain about scenario based modelling.	10	L2	CO2
	b.	Illustrate regarding how can we create a Behavioral Model.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain Agility along with the principles of Agility.	10	L2	CO3
	b.	Explain the Extreme Programming Process.	06	L2	CO3
	c.	Explain about the critics of XP.	04	L2	CO3
		OR			
Q.6	a.	Explain the scrum flow process.	08	L2	CO3
	b.	Explain the communication principles guiding framework activity.	08	L2	CO3
	c.	How can we validate and test principles in coding.	04	L1	CO3
		Module – 4			
Q.7	a.	Define Project. Show the contrast of software projects with other types of projects.	06	L2	CO4
	b.	Explain the ISO 12207 software development life cycle with a neat diagram.	10	L2	CO4
	c.	What are outsourced projects?	04	L1	CO4
		OR			
Q.8	a.	Illustrate the cost benefit evaluation techniques.	10	L2	CO4
	b.	Illustrate the concept of Risk evaluation.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain the details to be drafted for achieving quality in software.	06	L2	CO5
	b.	Explain the software quality characteristics of ISO 9126.	08	L2	CO5
	c.	Explain process requirements for the process quality management.	06	L2	CO5
		OR			
Q.10	a.	Explain about the decomposition techniques.	10	L2	CO5
	b.	Explain the COCOMO II model.	10	L2	CO5

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Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Computer Networks

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain fundamental characteristics and data representation in data communication.	6	L1	CO1
	b.	Discuss types of connection and the basic topologies in networks.	6	L1	CO1
	c.	Explain packet switching and circuit switching with neat diagrams.	8	L1	CO1
		OR			
Q.2	a.	Explain the layers of TCP/IP protocol suite.	8	L2	CO2
	b.	Explain types of packet switched networks and evaluate the total delay time of both.	12	L2	CO2
		Module – 2			
Q.3	a.	Explain types of errors and Hamming distance. Find the Hamming distance between the following : i) d(000, 011) ii) d(10101, 11110).	8	L3	CO2
	b.	Describe the working of CRC encoder and decoder. Perform division with respect to the following : Data word : 1001 Divisor : 1011.	12	L3	CO2
		OR			
Q.4	a.	Explain stop-and-wait protocol with FSM.	6	L2	CO2
	b.	Explain the three types of frames in HDLC.	8	L2	CO2
	c.	Discuss controlled-access protocol using reservation method.	6	L2	CO2
		Module – 3			
Q.5	a.	Explain the services offered by network layer.	6	L2	CO2
	b.	Define address space. Differentiate between classful addressing and classless addressing.	8	L2	CO2
	c.	Explain Network Address Resolution (NAT) with a neat diagram.	6	L2	CO3

		OR			
Q.6	**a.**	Explain IPv6 packet format in detail.	**6**	**L2**	**CO2**
	b.	Discuss D-V routing highlighting the importance of distance vector.	**7**	**L2**	**CO2**
	c.	Describe BGP protocol in detail.	**7**	**L2**	**CO4**
		Module – 4			
Q.7	**a.**	Explain the concept of port numbers mentioning ICANN ranges.	**5**	**L2**	**CO3**
	b.	Explain Go-Back-N protocol.	**9**	**L2**	**CO4**
	c.	Explain TCP segment format with a neat diagram.	**6**	**L3**	**CO3**
		OR			
Q.8	**a.**	Discuss the connection establishment in TCP.	**8**	**L2**	**CO3**
	b.	Explain error control in TCP using acknowledgements.	**4**	**L2**	**CO3**
	c.	Discuss three algorithms for handling congestion in TCP.	**8**	**L2**	**CO3**
		Module – 5			
Q.9	**a.**	Discuss application layer paradigms with neat diagram.	**5**	**L2**	**CO3**
	b.	Explain the use of sockets in process-to-process communication.	**7**	**L2**	**CO3**
	c.	Discuss the connection types in HTTP along with formats of messages.	**8**	**L2**	**CO3**
		OR			
Q.10	**a.**	Explain POP and IMAP protocols.	**8**	**L2**	**CO4**
	b.	Discuss the applications of SSH protocol.	**4**	**L2**	**CO4**
	c.	Explain resolution in DNS.	**8**	**L2**	**CO3**

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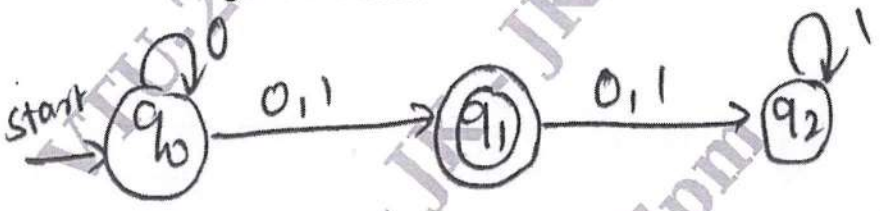
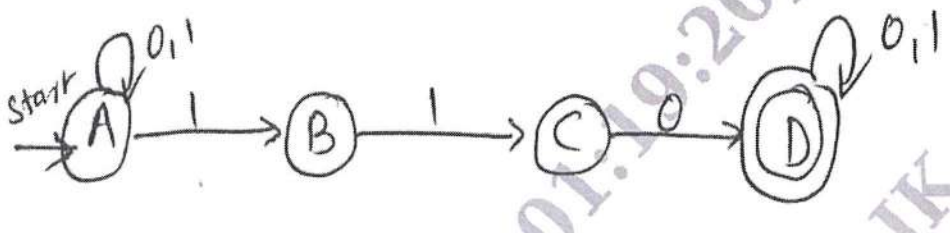
BCS503

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Theory of Computation

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define the following with example. i) Alphabet ii) String iii) Power of an Alphabet iv) Language v) Problem	05	L2	CO1
	b.	Design DFA for the following languages. i) DFA to accept string of 0's, 1's and 2's beginning with a '0' followed by odd number of 1's and ending with a '2'. ii) L = { W∈ {0,1}* : w does not have 001 as a substring}	08	L3	CO1
	c.	Convert the following NFA to DFA. 	07	L3	CO1
		OR			
Q.2	a.	Design an NFA to recognize the following set of strings 0101, 101 and 011.	05	L2	CO1
	b.	Design an DFA to accept binary numbers divisible by 5.	08	L3	CO1
	c.	Obtain DFA for the following ∈ – NFA δ ∈ a b c →p ϕ {p} {q} {r} q {p} {q} {r} ϕ *r {q} {r} ϕ {p}	07	L3	CO1
		Module – 2			
Q.3	a.	Write the Regular Expression for the following languages. i) $L = \{a^n b^m \mid n >= 4, m <= 3\}$ ii) RE to accept words with two or more letters but beginning and ending with the same letter where ∑ = {a, b}	06	L3	CO2
	b.	Obtain ∈ – NFA for given Regular Expression $(a + b)^* aa (a + b)^*$	06	L3	CO2
	c.	Find the minimized DFA of the following δ a b →A B F B G C *C A C D C G E H F F C G G G E H G C	08	L3	CO2

		OR			
Q.4	**a.**	State and prove pumping theorem for regular languages. Show that the language $L = \{a^n b^n \mid n \geq o\}$ is not regular.	**06**	**L3**	**CO2**
	b.	Convert the following FA to RE using state elimination method.  	**06**	**L3**	**CO2**
	c.	Prove that the Regular Languages are closed under : i) Union ii) Complementation iii) Intersection iv) Difference	**08**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	Design CFG for the following Languages. i) $L = \{ ww^R$ where $W \in \{a, b\}^* \}$ ii) $L = \{ 0^m 1^m 2^n \mid m \geq 1$ and $n \geq 0\}$ iii) $L = \{ a^n b^{n+3} \mid n \geq 0 \}$	**10**	**L3**	**CO3**
	b.	Consider the grammar G with productions $S \rightarrow aSbS \mid bSaS \mid \in$ Obtain LMD, RMD and parse tree for the string aababb. Is the grammar ambiguous.	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	Obtain PDA to accept the language $L = \{ wCw^R \mid W \in (a + b)^* \}$ and show the moves made by the PDA for the string aabCbaa.	**10**	**L3**	**CO3**
	b.	Convert the following CFG to PDA $S \rightarrow aABC$ $A \rightarrow aB \mid a$ $B \rightarrow bA \mid b$ $C \rightarrow a$	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Define CNF. Convert the following CFG to CNF $E \rightarrow E + T/T \quad T \rightarrow T * F/F \quad F \rightarrow (E) / I \quad I \rightarrow Ia / Ib \mid a \mid b$	**10**	**L3**	**CO4**
	b.	State and prove pumping lemma for context Free Grammars. Show that $L = \{ 0^n 1^n 2^n \mid n \geq 1 \}$ is not content free.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Define CNF convert the following CFG to CNF $S \rightarrow AB \quad A \rightarrow aA \mid bB \mid b \quad B \rightarrow b$	**10**	**L3**	**CO4**
	b.	Prove that the content free languages are closed under i) Union ii) Concatenation iii) Homomorphism	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Define a Turing Machine. Explain the working of a basic Turing machine with neat diagram.	**08**	**L2**	**CO5**
	b.	Design a Turing Machine to accept the language $L = \{ a^n b^n c^n \mid n \geq 1 \}$. Draw the transition diagram and show the moves made by TM for the string : aabbcc.	**12**	**L3**	**CO5**
		OR			
Q.10	**a.**	What are the programming Techniques for Turing Machine. Explain.	**10**	**L2**	**CO5**
	b.	Write short notes on : i) Multi Tape Turing Machine ii) Non Deterministic Turing Machine	**10**	**L2**	**CO5**

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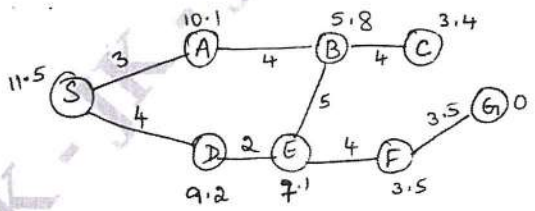
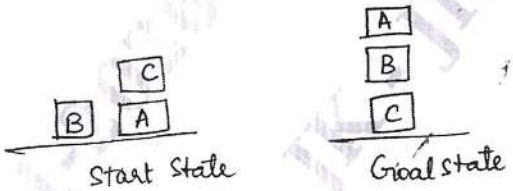
BCS515B

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Artificial Intelligence

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain Alan Turing's significant contribution to artificial intelligence and give a brief introduction to the Turing Test in AI.	10	L2	CO1
	b.	Define agent, agent function and agent program. Explain with a neat diagram how agent interacts with environment through sensors and actuators.	10	L1	CO1
		OR			
Q.2	a.	List the types of Agents. Explain Goal Based and utility based agent with neat diagram.	10	L2	CO1
	b.	Compare and contrast between i) Deterministic and Stochastic ii) Static and Dynamic iii) Episodic and Sequential iv) Fully observable and partially observable. Give example for each of the nature of environment given above.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the tree search and graph search algorithms.	10	L2	CO2
	b.	Explain problems solving agents along with algorithm and illustrate the incremental formulation of 8-Queens problem.	10	L2	CO2
		OR			
Q.4	a.	List and explain the criteria to measure the performance of search strategies.	10	L2	CO2
	b.	Explain Breadth first search technique as a problem solving strategy with its benefits and shortcomings.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain A* algorithm for shortest path and apply the same for the below graph.  Fig Q5(a)	10	L3	CO3

	b.	Apply heuristic search algorithm on the given 8 puzzle problem to reach the goal state from the initial state Start state: 1 2 3 / _ 4 6 / 7 5 8 Goal state: 1 2 3 / 4 5 6 / 7 8 _	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	Define knowledge based agent. Outline the knowledge based agent program.	**10**	**L1**	**CO3**
	b.	Define Propositional Logic. Explain syntax and semantics.	**10**	**L1**	**CO3**
		Module – 4			
Q.7	**a.**	Explain first order logic with its syntax in BNF form.	**10**	**L2**	**CO4**
	b.	Explain Quantifiers. Differentiate between Universal and Existential Quantifier.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Illustrate Kinship Domain with an example.	**10**	**L2**	**CO4**
	b.	Illustrate unification algorithm used for reasoning with example.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Outline the backward chaining algorithm for definite clauses. Construct a proof tree to prove that "west is a criminal".	**10**	**L2**	**CO5**
	b.	Apply Resolution for "west is a criminal" and "curiosity killed the cat" example.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Define Planning. Explain block world problem for the following start state and End state.  	**10**	**L2**	**CO5**
	b.	Illustrate how planning graph data structure can be used to give a better heuristic for a planning problem.	**10**	**L2**	**CO5**

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BCS515C

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Unix System Programming

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	List and explain the salient features of UNIX Operating system.	10	L1	CO1
	b.	Explain the architecture of UNIX with a neat diagram.	10	L2	CO1
		OR			
Q.2	a.	Explain any 4 directory related commands with syntax and example of each.	10	L2	CO1
	b.	Explain the file types and the file system tree with neat diagram.	10	L1	CO1
		Module – 2			
Q.3	a.	Illustrate the file attributes and permissions with its options.	10	L2	CO2
	b.	Explain the use of chmod command to change file permission using both absolute and relative methods.	10	L2	CO2
		OR			
Q.4	a.	Explain grep command with all its options.	10	L2	CO2
	b.	How test command works? Explain for each with example.	6	L2	CO2
	c.	Write a shell script to display current date and calendar.	4	L3	CO2
		Module – 3			
Q.5	a.	Explain the POSIX and ISO C standards.	4	L2	CO3
	b.	Explain the environment list. Demonstrate how to create, set and update environment variables using C program.	10	L3	CO3
	c.	How to change the file properties? Explain with its syntax and purpose.	6	L2	CO3
		OR			
Q.6	a.	With a neat diagram, explain the memory layout of a C program in UNIX and explain memory allocation API's.	10	L2	CO3
	b.	How a process can be initiated and terminated with a neat diagram? Explain.	10	L2	CO3

		Module – 4			
Q.7	**a.**	Explain fork( ) and vfork( ) with the programming example.	**10**	**L3**	**CO4**
	b.	Write a description on wait and waitpid( ) with suitable example.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	What are Pipes? What are its limitations? Write a C program to send data from parent to child over a pipe.	**10**	**L3**	**CO4**
	b.	With a neat diagram, explain the client-server communication using FIFO.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain Daemon process by developing program to transform a normal user into daemon process.	**10**	**L3**	**CO5**
	b.	Illustrate signal in UNIX and develop a program to setup signal handlers for sigsetjmp( ) and abort( ).	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Discuss how error logging is done by daemon process with suitable diagram.	**10**	**L2**	**CO5**
	b.	Explain the prototypes of following API's : i) Signal ii) Kill iii) Alarm iv) Sigaction v) System	**10**	**L2**	**CO5**

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BIC515A

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
IOT System Architecture

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is a device? Explain the working of a basic device.	10	L2	CO1
	b.	Define IOT Architecture. What is Domain, positioning explain with a neat diagram.	10	L2	CO1
		OR			
Q.2	a.	Explain the design principles and capabilities of an IOT architecture.	10	L2	CO1
	b.	Explain IOT architecture outline with neat diagram.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the IOT functions Model.	10	L2	CO2
	b.	Explain any 5 ETSI M2M service capabilities.	10	L2	CO2
		OR			
Q.4	a.	Explain with a neat diagram ETSI M2M high-level architecture.	10	L2	CO2
	b.	Discuss IOT Reference Model.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the financial cost considerations for devices and networks.	10	L2	CO3
	b.	Explain IOT enabled Parking lot.	10	L2	CO3
		OR			
Q.6	a.	What is functional view for an IOT reference architecture?	10	L2	CO3
	b.	Explain the technical design constraints for devices.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain hub networks of IOT network model.	10	L2	CO4
	b.	Explain security of IOT system architecture.	10	L2	CO4
		OR			
Q.8	a.	Explain IOT-oriented protocols in detail.	10	L2	CO2
	b.	Discuss IOT event analysis in detail.	10	L2	CO2

		Module – 5			
Q.9	**a.**	What are the applications of Industrial IOT?	**10**	**L2**	**CO5**
	b.	Explain Industrial IOT Architecture.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain generic application security in IIOT.	**10**	**L2**	**CO5**
	b.	Explain ARMET approach in IOT system.	**10**	**L2**	**CO5**

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BAD515C

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Cloud Computing

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the concept of multicore CPU's with the memory hierarchy.	5	L2	CO1
	b.	Explain the concept of "System Availability". When a given system is said to be more reliable?	5	L2	CO1
	c.	Identify how the GPU computing contributed to the advancement of high performance computing and what are the key challenges and innovations necessary to achieve exascale computing and beyond.	10	L3	CO1
		OR			
Q.2	a.	Explain the concept of multithreading by considering any 2 micro architectures present in the modern CPU.	5	L2	CO1
	b.	What is Service-Oriented Architecture (SOA) and what are its core principles?	5	L2	CO1
	c.	Identify how the advancements in parallel processing and distributed computing contributed to the evolution of High-performance computing and high-throughput computing system? Give the examples of how these systems have adapted to meet modern computational needs?	10	L3	CO1
		Module – 2			
Q.3	a.	Apply the concept of virtualization to a data center consolidation scenario where resource utilization is low. Explain how different levels of virtualization could be implemented to increase efficiency.	10	L3	CO2
	b.	Explain hardware assisted virtualization concept by considering Intel X86 processor.	6	L2	CO2
	c.	What is Full Virtualization and Para Virtualization?	4	L2	CO2
		OR			
Q.4	a.	In a cloud service environment needing high availability, how live migration could be applied to ensure minimal service interruption. Include the role of memory, file systems and network migration in maintaining service continuity?	10	L3	CO2
	b.	Explain the concept of encalyptus for virtual networking of private cloud.	6	L2	CO2
	c.	What is a Hypervisor? Explain the Xen Hyper visor architecture with Domain O and Domain U?	4	L2	CO2

		Module – 3			
Q.5	**a.**	Explain the Architectural Design challenges in cloud architecture development.	**10**	**L2**	**CO3**
	b.	Explain Private, Public and Hybrid clouds with example.	**6**	**L2**	**CO3**
	c.	Explain the standard data center networking structure to access the internet.	**4**	**L2**	**CO3**
		OR			
Q.6	**a.**	What are the criteria/requirements to be considered while designing the data center inter connection networks? Explain the FAT-tree interconnection topology used for data-center construction.	**10**	**L2**	**CO3**
	b.	Describe with diagram how the cooling system works in a raised floor data center using hot-cold air circulation?	**6**	**L2**	**CO3**
	c.	Explain the different Resource Provisioning Methods.	**4**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the concept of XOAR with neat diagram and list the design goals of XOAR.	**10**	**L2**	**CO4**
	b.	Explain the concept of distributed defense against DDOS flooding attacks and man-in the middle attacks.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain the concept of virtual machine security services provided by the hypervisor and dedicated VM providing security with TCB (Trusted Computing Base).	**10**	**L2**	**CO4**
	b.	Explain the different security challenges for mobile devices in cloud environment. List out the unique security threats affecting mobile devices and the reasons for these security risks.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the Google File Systems (GFS) with its Architecture and Data mutation sequence in GFS.	**10**	**L2**	**CO5**
	b.	Explain the process of Amazon EC2 programming and Amazon Simple Storage Service (S3).	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	With formal definition of Map Reduce, Explain the Map Reduce frame work and Map Reduce Logical Data Flow.	**10**	**L2**	**CO5**
	b.	Explain Dryad frame work and its job structure, control and dataflow.	**10**	**L2**	**CO5**

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BCS601

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Cloud Computing

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Distributed Systems. Explain any three system models used in distributed and cloud computing with examples.	10	L2	CO1
	b.	What is Scalable Computing? Explain how cloud computing enables scalable computing over the Internet.	10	L2	CO1
		OR			
Q.2	a.	Compare and contrast cluster computing grid computing and cloud computing in terms of Architecture and Usage.	10	L3	CO1
	b.	Analyze the challenges in distributed systems related to performance, security and energy efficiency.	10	L3	CO1
		Module – 2			
Q.3	a.	Define Virtualization. Explain the different implementation levels of virtualization with examples.	10	L2	CO2
	b.	Define Virtual Clusters. Explain how virtual clusters are built and used in Distributed Systems.	10	L2	CO2
		OR			
Q.4	a.	Explain with examples how Resource Management is handled in Virtual Clusters.	10	L3	CO2
	b.	How does virtualization support data center automation and dynamic resource management?	10	L3	CO2
		Module – 3			
Q.5	a.	Define Cloud Computing. Explain the different service models (IaaS, PaaS, SaaS) with examples.	10	L2	CO3
	b.	Explain the basic components and design considerations of a modern data center.	10	L2	CO3
		OR			
Q.6	a.	Describe the Architecture design of compute clouds with the help of a diagram.	10	L2	CO3
	b.	Compare the public cloud platforms: Google App Engine (GAE), Amazon Web Services (AWS) and Microsoft Azure.	10	L3	CO3

		Module – 4			
Q.7	**a.**	Define Cloud Security. What are the top 5 security concerns faced by cloud users?	**10**	**L1**	**CO4**
	b.	What is a Privacy Impact Assessment (PIA)? List its key components and purpose in a cloud environment.	**10**	**L1**	**CO4**
		OR			
Q.8	**a.**	Analyze the security risks posed by shared virtual machine images and management operating systems in public cloud environments.	**10**	**L4**	**CO4**
	b.	Explain how XOAR architecture and trusted hypervisors enhance cloud security analyze their impact on virtualized data center environments.	**10**	**L4**	**CO4**
		Module – 5			
Q.9	**a.**	Apply the concept of MapReduce by writing a simple program to count the number of occurrences of each word in a text file.	**10**	**L3**	**CO5**
	b.	Develop a simple Python or Java application for Google App Engine to serve dynamic content using a basic web handler.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Analyze the differences between Parallel Computing Paradigms (MPI/openMP) and Cloud Programming Paradigms (MapReduce, GAE) in terms of scalability and fault tolerance.	**10**	**L4**	**CO5**
	b.	Examine how emerging cloud software environments like Microsoft Azure integrate PaaS, IaaS and SaaS. Analyze the flexibility offered to developers.	**10**	**L4**	**CO5**

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Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Machine Learning

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

			M	L	C
		Module – 1			
Q.1	a.	Explain the machine learning process and its applications with a suitable diagram.	6	L2	CO1
	b.	Explain the purpose of dimensionality reduction and its importance in the domain of machine learning.	8	L2	CO1
	c.	Write short notes on the following : i) Min-Max Scaling ii) Z-score iii) Mean iv) Standard Deviation v) Median vi) Dispersion.	6	L2	CO1
		OR			
Q.2	a.	Explain the elements of Big Data, data types, and Big Data analytics in relation to Machine Learning.	6	L2	CO1
	b.	Explain data collection and data pre-processing.	8	L2	CO1
	c.	Explain the removal of noise or outlier data with a suitable example.	6	L2	CO1
		Module – 2			
Q.3	a.	Explain the Gaussian Elimination Algorithm and Solve the following problem $x + y + z = 2$ $x + 2y + 3z = 5$ $2x + 3y + 4z = 11$	10	L3	CO2
	b.	Explain the Types of Machine Learning (ML)	4	L2	CO2
	c.	Illustrate PCA, why it is important, and write the PCA Algorithm.	6	L3	CO2
		OR			
Q.4	a.	Solve the problem using the Find – S Algorithm :	10	L3	CO2

S. No	Horns	Tail	Tusks	Paws	Fur	Color	Hooves	Size	Elephant
1	No	Short	Yes	No	No	Black	No	Big	Yes
2	Yes	Short	No	No	No	Brown	Yes	Medium	No
3	No	Short	Yes	No	No	Black	No	Medium	Yes
4	No	Long	No	Yes	Yes	White	No	Medium	No
5	No	Short	Yes	Yes	Yes	Black	No	Big	Yes

	b.	Write a short note on Binomial Distribution, Poisson Distribution and Bernoulli Distribution.	4	L2	CO2
	c.	Explain LU Decomposition and solve the following problem $A = \begin{bmatrix} 2 & 3 & 1 \\ 4 & 7 & 3 \\ 6 & 18 & 5 \end{bmatrix}$	6	L3	CO2
		Module – 3			
Q.5	a.	Explain the KNN algorithm and solve the following problem : In the KPSC exam, candidates secured the following marks. Based on those obtained marks, categorize whether the candidate is eligible for the exam or not using K-Nearest Neighbors. Given instance as follows : • General Studies X(O1) = 07 • Computer Science Y(O2) = 6 • Language = 4 • K = 3 nearest neighbors Note : Training data is provided, where O represents observable values.	10	L3	CO3

General Studies	Computer Science	Languages	Eligible
4	3	5	Fail
6	7	8	Pass
6	8	6	Pass
5	5	4	Fail
8	8	9	Pass

	b.	Explain the Local Weighted KNN, Logistic Regression, and Nearest centroid classifier algorithms.	10	L3	CO3
		OR			
Q.6	a.	Explain Linear Regression and Polynomial Regression and solve a Linear Regression problem : Apply linear regression technique to predict the 7th week sales	10	L3	CO3

Table : Sample data

X (week)	Y (Sales in Thousands)
1	1.2
2	1.8
3	2.6
4	3.2
5	3.8

	b.	Explain ID3 algorithm and solve the following problem :	10	L3	CO3

Age	Competition	Type	Profit
Old	Yes	S/W	Down
Old	No	S/W	Down
Old	No	H/W	Down
Mid	Yes	S/W	Down
Mid	Yes	H/W	Down
Mid	No	H/W	Up
Mid	No	S/W	Up
New	Yes	S/W	Up
New	No	H/W	Up
New	No	S/W	Up

Module – 4

Q.7 **a.** Explain Baye's Theorem and Bayes' optimal classifier. | **8** | **L2** | **CO4**

b. Explain the Naïve Bayes algorithm and solve the problem using the Naïve Bayes classifier. Classify using Naïve Bayes' for the new sample : (fruit = {yellow, sweet, long}) | **12** | **L3** | **CO4**

Data :

Fruit	Yellow	Sweet	Long
Orange	350	450	0
Banana	400	300	350
Others	50	100	50

OR

Q.8 **a.** Write a note on :
i) Perceptron
ii) Different types of Artificial Neural Network with a suitable diagram. | **8** | **L2** | **CO4**

b. Explain the ANN Node structure and all its associated activation function with suitable mathematical notations. | **12** | **L2** | **CO4**

Module – 5

Q.9 **a.** Write a short note on Clustering and classification along with advantages and disadvantages of the clustering algorithm. | **6** | **L2** | **CO5**

b. Explain the proximity measures. | **6** | **L2** | **CO5**

c. Explain the Mean Shift Clustering Algorithm and solve the following problem. Start with point P1(1, 1)
P1 = (1, 1)
P2 = (2, 1)
P3 = (2, 2)
P4 = (8, 8)
P5 = (9, 8)
P6 = (8, 9)
Mean shift clustering using a bandwidth (radius) of 4 units.
Stopping threshold : Stop when the new center moves less than 0.01 | **8** | **L3** | **CO5**

OR

Q.10 **a.** Explain the K-Mean clustering algorithm and solve the following problem. | **12** | **L3** | **CO5**

Point	X	Y
A	1	1
B	1.5	2
C	3	4
D	5	7
E	3.5	5
F	4.5	5
G	3.5	4.5

Lets apply K-Means with K = 2

b. Short note on : Monte Carlo method, temporal difference learning, Q-learning and SARSA learning. | **8** | **L2** | **CO5**

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BCS613B

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Computer Vision

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the working of a digital camera in capturing images.	10	L2	CO1
	b.	Differentiate between linear and non-linear filtering techniques.	4	L2	CO1
	c.	Assume the given image 5 × 5 pixel matrix is a part of a satellite image, where each element in the matrix represent the digital number (DN) of a pixel in the image. Based on this assumption. Calculate the following questions. I = [10 20 30 40 50 60 70 80 90 100 110 80 130 90 150 160 170 180 190 200 210 220 230 240 250] What is the value of the pixel position (2, 2) (3, 2) and (3, 3) applying the 3 × 3 mean filter assume index start from 0.	6	L3	CO1
		OR			
Q.2	a.	Explain how image brightness and contrast adjustments are performed.	6	L2	CO1
	b.	Discuss the role of point operators in image processing with examples.	6	L2	CO1
	c.	For the image matrix mentioned in the matrix IC. What is the value of the pixel position at (2, 3), (3, 3), (2, 2) apply the weighted average filter.	8	L3	CO1
		Module – 2			
Q.3	a.	Explain neighborhood operators and their significance in image processing.	6	L2	CO2
	b.	What is the Fourier transform in image processing and how is it applied?	6	L2	CO2
	c.	A 3 × 3 grayscale image matrix : I = [100 100 100 100 255 100 100 100 100] This matrix represents a smooth background (value 100) with a sharp impulse (value 255) at the centre think of it as a "salt noise".	8	L3	CO2

		OR			
Q.4	**a.**	Explain the importance of scaling and rotation in geometric transformations.	**10**	**L2**	**CO2**
	b.	Discuss the geometric transformations used in image processing.	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Explain the image degradation/restoration process model.	**8**	**L2**	**CO3**
	b.	How can point horizontal and vertical lines be detected in an image, and what techniques are commonly used for this task.	**6**	**L2**	**CO3**
	c.	Identify point detection, horizontal line and vertical line detection in the following matrix $I = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$	**6**	**L3**	**CO3**
		OR			
Q.6	**a.**	Describe region growing and region splitting techniques in segmentation.	**10**	**L2**	**CO3**
	b.	Given a 3 bit image given below. Assume seed value of 6, segment the following image using 8 connectivity and threshold = 3. How many segments are identified? $I = \begin{bmatrix} 2 & 2 & 7 & 2 & 1 \\ 1 & 7 & 6 & 6 & 2 \\ 7 & 6 & 6 & 5 & 7 \\ 2 & 4 & 5 & 4 & 2 \\ 1 & 2 & 5 & 1 & 1 \end{bmatrix}$	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Discuss the fundamentals of color image processing.	**10**	**L2**	**CO4**
	b.	Explain pseudocolor image processing and its applications.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Compare RGB and CMYK color models in image processing.	**10**	**L2**	**CO4**
	b.	Describe the process of color image smoothing and sharpening.	**10**	**L2**	**CO4**

Module – 5					
Q.9	a.	Discuss the operations of opening and closing in morphology.	10	L2	CO5
	b.	Consider the following matrix and structuring element. [0 0 0 0 0 0 0 0 1 1 0 0 0 1 1 1 1 0 0 0 1 1 0 0 0 0 0 0 0 0] SE = [1 1 1] Perform following operation on the following image using i) A dilate SE ii) A^C erode SE	10	L3	CO5
OR					
Q.10	a.	How is feature used in image classifications?	10	L3	CO5
	b.	Perform morphological opening and closing operation on the following image with structuring element and write the out of operations [0 0 0 0 0 0 1 1 1 0 0 1 1 1 0 0 1 1 1 0] SE [0 1 0 1 1 0 0 1 0]	10	L3	CO5

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BIS601

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Full Stack Development

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define statements and comments in JavaScripts. Create a script that calculates the sum of 2 numbers and displays the result in a alert Box.	6	L1	CO1
	b.	Explain the various Data types in JavaScripts with examples.	6	L2	CO1
	c.	Define an array. Create an array of 5 cities and perform the following operations : i) Log the total number of cities ii) Add a new city at the end iii) Remove the first city	8	L3	CO1
		OR			
Q.2	a.	Define a Function in JavaScript. Write a function is Plaindrome (str) that checks if a given string is a palindrome?	6	L3	CO1
	b.	Define an object. Create an object student with properties : name (strings), grade (number), subject (array) displayInfo( ) (method of log student's details)	6	L3	CO1
	c.	Explain loops in JavaScripts. Discuss the following types of loops with examples i) For loop ii) While loop iii) Do-while loop	8	L2	CO1
		Module – 2			
Q.3	a.	Explain a DOM Tree. Discuss the working with DOM Tree using i) getElement by Id( ) ii) getElement by ClassName( ) iii) getElement by TagName( )	8	L2	CO2
	b.	Explain an Event. Discuss the various types of events in JavaScript.	6	L2	CO2
	c.	Explain Event listeners in JavaScript. Discuss how to add event listeners to DOM element nodes.	6	L2	CO2
		OR			
Q.4	a.	Discuss event Delegation in JavaScripts, explain with a example of handling clicks on a list of items.	8	L2	CO2
	b.	Create a button in HTML with text "Click Me". Add event listener to log "Button clicked" to the console, when the button is clicked. Add a event listener to the document that logs the key pressed by the user.	12	L2	CO2

		Module – 3			
Q.5	**a.**	Discuss, what is MERN? Explain the MERN stack components.	**6**	**L3**	**CO3**
	b.	Discuss what are React classes and its features. Explain a simple React class using a jsx File.	**6**	**L3**	**CO3**
	c.	Explain how React and React DOM can be used in HTML file to creak a server-less Hello world.	**8**	**L3**	**CO3**
		OR			
Q.6	**a.**	Explain the usage of Issue Tracker used in the React components.	**6**	**L2**	**CO3**
	b.	Discuss what are composing components used in React Components. Write a code in jsx file using composing components.	**6**	**L3**	**CO3**
	c.	Build a React application to track issues. Display a list of issues (use static data). Each issue should have a title, description and status (eg open/closed). Render a list using a functional component.	**8**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain, what are Initial state and Async state initialization.	**6**	**L2**	**CO4**
	b.	Explain Event handling in inter active issue.	**7**	**L2**	**CO4**
	c.	Discuss the use of stateless components? Give an example of converting class components to stateless components.	**7**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain Designing components in React state. Compare State Vs Prop.	**6**	**L3**	**CO4**
	b.	Explain Express for Node.js. Discuss the Routing in Express.	**8**	**L3**	**CO4**
	c.	Discuss Key Features of GraphQL. Explain GraphQL Query.	**6**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain MongoDB. Discuss MongoDB Document structure.	**6**	**L2**	**CO5**
	b.	Explain MongoDB collection and database schema.	**7**	**L2**	**CO5**
	c.	Explain the various MongoDB CRUD operations.	**7**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain Back End Modules. Discuss how key modules interact in Issue Tracker API.	**6**	**L2**	**CO5**
	b.	Explain Front end modules with webpack.	**6**	**L2**	**CO5**
	c.	Explain Hot Module Replacement (HMR) and discuss the HMR implementing in a Express based UI server.	**8**	**L2**	**CO5**

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BIS613D

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Cloud Computing and Security

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the different system models used in distributed and cloud computing.	10	L2	CO1
	b.	What are the challenges in ensuring security in a distributed cloud set up?	10	L3	CO1
		OR			
Q.2	a.	Compare performance and energy efficiency in Traditional Vs Cloud-based systems.	10	L3	CO1
	b.	Illustrate the architectural difference between cluster and grid computing.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the different levels of virtualization implementation.	10	L2	CO2
	b.	List and explain types of hypervisors with examples.	10	L2	CO2
		OR			
Q.4	a.	Explain memory and I/O device virtualization with practical scenarios.	10	L2	CO2
	b.	What are the advantages of virtual clusters over physical clusters.	10	L1	CO2
		Module – 3			
Q.5	a.	Compare the three primary cloud service models : IaaS, PaaS and SaaS.	10	L3	CO3
	b.	Describe the cloud platforms : Google App Engine(GAE), AWS, and Azure.	10	L2	CO3
		OR			
Q.6	a.	What is Inter-Cloud Resource Management? Why is it important?	10	L1	CO3
	b.	Explain the concept of federated cloud and its challenges.	10	L2	CO3
		Module – 4			
Q.7	a.	What is Privacy Impact Assessment (PIA) in cloud computing?	10	L1	CO4
	b.	Compare OS-level security Vs VM level security in cloud.	10	L3	CO4
		OR			
Q.8	a.	Why is security a top concern in cloud computing?	10	L2	CO4
	b.	How does XOAR provide a trusted hypervisor environment?	10	L2	CO4
		Module – 5			
Q.9	a.	How does MapReduce support distributed computing?	10	L2	CO5
	b.	What are emerging cloud software environments? Give examples.	10	L2	CO5
		OR			
Q.10	a.	Discuss application development or AWS using Lambda or EC2.	10	L2	CO5
	b.	Describe parallel computing paradigms in cloud platforms.	10	L2	CO5

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BAI654D

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Introduction to Artificial Intelligence

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain with examples, some of the task domains of Artificial Intelligence. Explain Question Answering.	10	L2	CO1
	b.	Explain the application of control strategies and heuristic search for production systems.	10	L2	CO1
		OR			
Q.2	a.	Bring out the features that used to represent AI as exploiting knowledge. Give the data structures and algorithm for a program that converts input text into structured internal form.	10	L3	CO1
	b.	Explain with examples, the issues in the design of search programs.	10	L3	CO1
		Module – 2			
Q.3	a.	Define the desirable properties of good system for representation of knowledge, with an algorithm explain property inheritance.	10	L2	CO2
	b.	With examples, show representation of Instance , ISA relationship , Computable functions and predicates.	10	L3	CO2
		OR			
Q.4	a.	With examples, explain the selection of granularity of representation and finding the right structures.	10	L1	CO2
	b.	Explain forward V/s backward reasoning with examples. What are the three basic approaches to the problem of conflict resolution in production system?	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the key issues to be addressed in non montonic reasoning systems? Explain with examples working of default logic and abduction.	10	L1	CO3
	b.	Define and explain the notions of Bayes Theorem with example. Describe some of the properties to be satisfied by combining functions.	10	L2	CO3
		OR			
Q.6	a.	With examples, describe the working of non dependency directed back tracking and context lattices.	10	L1	CO3
	b.	Bring out the concepts of Bayesian networks like Causality , DAG , Conditional probabilities with examples.	10	L2	CO3

		Module – 4			
Q.7	**a.**	Explain the working of MINIMAX search procedure with example.	**10**	**L2**	**CO5**
	b.	Write algorithms for Depth First Iterative deepening and Iterative Deepening A* and illustrate on an example.	**10**	**L3**	**CO5**
		OR			
Q.8	**a.**	Explain the various components of natural language understanding process.	**10**	**L2**	**CO5**
	b.	Give simple grammar for fragment of English and differentiate Top down V/s Bottom up parsing.	**10**	**L3**	**CO5**
		Module – 5			
Q.9	**a.**	Explain the working of Rote learning and learning by taking advice.	**10**	**L2**	**CO4**
	b.	Explain Knowledge Acquisition process in MOLE and SALT.	**10**	**L1**	**CO4**
		OR			
Q.10	**a.**	Explain the working and characteristics of Theory driven discovery.	**10**	**L2**	**CO4**
	b.	Explain the rules included in R1 , PROSPECTOR and DESIGN ADVISOR shells.	**10**	**L2**	**CO4**

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BCS701

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Internet of Things

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the characteristics and applications of IoT.	10	L2	CO1
	b.	List and explain the various IoT enabling technologies.	10	L2	CO1
		OR			
Q.2	a.	What is IoT? Explain the generic block diagram of an IoT device.	10	L2	CO1
	b.	Describe the components of an IoT system and explain the IoT level-1 system with a diagram.	10	L2	CO1
		Module – 2			
Q.3	a.	Describe the M2M system architecture and M2M gateway with block diagrams.	10	L2	CO2
	b.	Explain the need for IoT system management.	10	L2	CO2
		OR			
Q.4	a.	Discuss the differences between M2M and IoT systems.	10	L3	CO2
	b.	Describe the IoT system management with NETCONF-YANG with a diagram.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the steps involved in IoT system design methodology with a diagram.	10	L2	CO3
	b.	Explain the following python data types with examples: i) Numbers ii) Strings iii) Lists iv) Tuples v) Dictionaries	10	L2	CO3
		OR			
Q.6	a.	Explain the IoT system for weather monitoring.	10	L2	CO3
	b.	With a program, describe the File Handling functionality of python to read and write using file object.	10	L2	CO3

		Module – 4			
Q.7	**a.**	Explain the various components and peripherals of the Rasberry Pi board.	**10**	**L2**	**CO4**
	b.	Write a python program for switching LED based on reading LDR (Light Sensor) reading.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Describe the Home Intrusion Detection system using IoT.	**10**	**L3**	**CO4**
	b.	Explain the smart parking IoT system.	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the components of Hadoop cluster and Hadoop MapReduce Job Execution.	**10**	**L2**	**CO5**
	b.	Write a short note on Apache Storm Framework.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Describe how Hadoop MapReduce for Batch Data Analysis with a diagram.	**10**	**L2**	**CO5**
	b.	Explain the key components of Hadoop YARN and its job execution framework.	**10**	**L2**	**CO5**

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BCS702

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Parallel Computing

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *M : Marks , L: Bloom's level , C: Course outcomes.*

		Module – 1	M	L	C
Q.1	a.	Explain in detail the classification of parallel computers according to Flynn's taxonomy. Compare SIMD and MIMD systems.	10	L1	CO1
	b.	Discuss shared memory and distributed memory architectures. Explain their working principle advantages and disadvantages.	10	L2	CO1
		OR			
Q.2	a.	What is cache coherence? Explain snooping and directory based coherence mechanisms with suitable example.	10	L3	CO1
	b.	Explain non-determinism and race conditions in shared memory programs. How can they be avoided?	10	L3	CO1
		Module – 2			
Q.3	a.	Explain GPU programming in detail.	10	L2	CO2
	b.	Describe input and output handling in MIMD and GPU systems.	10	L2	CO2
		OR			
Q.4	a.	Explain Amdahl's law with example and discuss it significance.	10	L3	CO2
	b.	Write a short note on timing and performance measurement of parallel programs.	10	L3	CO2
		Module – 3			
Q.5	a.	Define and explain the following MPI functions with syntax and purpose : i) MPI_Init( ) ii) MPI_Finalize( ) iii) MPI_Comm_Size( ) iv) MPI_Comm_rank( )	10	L3	CO3
	b.	Explain the concept of point to point communication in MPI with suitable example.	10	L2	CO3
		OR			
Q.6	a.	Explain the working of trapezoidal rule program in MPI.	10	L3	CO3
	b.	Compare the traditional global sum using process 0 as collector with tree structured global sum.	10	L3	CO3

		Module – 4			
Q.7	**a.**	Explain the structure and working of an OpenMP "Hello world" program.	**6**	**L2**	**CO4**
	b.	Explain the purpose of the reduction clause in OpenMP with example.	**6**	**L2**	**CO4**
	c.	Write a OpenMP program to calculate n-Fibonacci using tasks.	**8**	**L2**	**CO4**
		OR			
Q.8	**a.**	Define OpenMP. Explain the key features of OpenMP and its advantages over Pthreads.	**6**	**L1**	**CO4**
	b.	Explain the concept of variable scope in OpenMP with suitable example.	**6**	**L2**	**CO4**
	c.	Estimate the value of π.	**8**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Define GPU and GPGPU. Explain the need for GPGPU.	**6**	**L1**	**CO5**
	b.	Explain thread, block and grid in CUDA.	**6**	**L2**	**CO5**
	c.	Explain CUDA vector addition program with suitable example.	**8**	**L3**	**CO5**
		OR			
Q.10	**a.**	Compare CUDA and OpenCL.	**6**	**L1**	**CO5**
	b.	Explain Kernel with shared memory.	**6**	**L2**	**CO5**
	c.	Explain Heterogeneous computing in detail.	**8**	**L3**	**CO5**

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BCS703

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Cryptography and Network Security

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Obtain Ciphertext for the given plaintext "HILLCIPHER" by applying the Hill Cipher technique using key $K = \begin{bmatrix} 03 & 02 \\ 08 & 05 \end{bmatrix}$	7	L3	CO1
	b.	Write a short note on Steganography and its advantages and disadvantages.	6	L2	CO1
	c.	With a neat diagram, explain the model for network security.	7	L2	CO1
		OR			
Q.2	a.	State the rules used for encryption in PLAYFAIR cipher and encrypt the message "COMPUTER" using the keyword "ENGINEERING" using PLAYFAIR cipher.	7	L3	CO1
	b.	Describe simple XOR and one – time pad encryption techniques with an example and their difficulties.	7	L2	CO1
	c.	With a block diagram, explain the various steps involved in encryption and key generation of the DES algorithm.	6	L2	CO1
		Module – 2			
Q.3	a.	Demonstrate the Diffie – Hellman key exchange algorithm.	8	L2	CO2
	b.	Perform encryption and decryption using the RSA algorithm given public key is 6 for two prime numbers 17 and 31 with message 3.	7	L3	CO2
	c.	Describe the fundamental requirements that a public key cryptosystem must meet to ensure security.	5	L2	CO2
		OR			
Q.4	a.	Explain briefly the elliptic curve cryptography and mention two applications.	8	L2	CO2
	b.	Let q = 719 and g = 5 , Xa = 157 , Xb = 293. Use the Diffie Hellman Key exchange algorithm to find Ya , Yb and Secret key K.	7	L3	CO2
	c.	Briefly explain the security aspects of the RSA algorithm.	5	L2	CO2

		Module – 3			
Q.5	**a.**	Explain the symmetric key distribution using Asymmetric Encryption.	**7**	**L2**	**CO3**
	b.	Explain the role of cryptographic hash functions in message authentication with a neat diagram.	**8**	**L2**	**CO3**
	c.	Discuss the general elements of an X.509 certificate.	**5**	**L2**	**CO3**
		OR			
Q.6	**a.**	What is Key Management? Explain with a neat diagram, how key usage can be controlled in encryption and decryption using control vectors.	**7**	**L2**	**CO3**
	b.	Describe the architecture of the Public Key Infrastructure X.509 (PKIX) model with a neat diagram.	**8**	**L2**	**CO3**
	c.	Write a short note on the various schemes of public key distribution.	**5**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain functions and cryptographic algorithms used in S/MIME functionality.	**8**	**L2**	**CO4**
	b.	Define TLS and explain its architecture with a neat diagram.	**7**	**L2**	**CO4**
	c.	Bring out the differences between Kerberos version 4 and version 5.	**5**	**L2**	**CO4**
		OR			
Q.8	**a.**	Describe remote user authentication using asymmetric encryption.	**8**	**L2**	**CO4**
	b.	Explain Pretty Good Privacy (PGP) message transmission and reception with a neat diagram.	**7**	**L2**	**CO4**
	c.	Elaborate on the various security approaches that address web security threats.	**5**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	How does Domain Keys Identified Mail (DKIM) address the threats posed by email attackers and what is its strategy for email authentication?	**8**	**L2**	**CO5**
	b.	Explain Internet Key Exchange (IKE) key determination features.	**7**	**L2**	**CO5**
	c.	Explain Basic combinations of Security Associations.	**5**	**L2**	**CO5**
		OR			
Q.10	**a.**	Illustrate the key components of the Internet mail architecture with a clear diagram.	**8**	**L2**	**CO5**
	b.	Explain the Encapsulating IP Security Payload.	**7**	**L2**	**CO5**
	c.	Describe the functional flow of Domain Keys Identified Mail (DKIM).	**5**	**L2**	**CO5**

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BCS714A

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Deep Learning

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain with a suitable diagram, how according to Hubel and Wiesels discovery a simple cell in the primary visual cortex of a cat fires at different rates depending upon the orientation of the line shown to the cat.	8	L2	CO1
	b.	Explain LeNet-5 hierarchical architecture and its use in automating the reading of postal service ZIP codes.	6	L2	CO1
	c.	Explain how the correctness of the sentence "The program impeccably translated the text" is determined using traditional learning and deep learning representations.	6	L2	CO1
		OR			
Q.2	a.	Explain one-hot representation of words for the vocabulary = {The, bat, sat, on, a, cat} and describe the process of finding whether a word in the vocabulary is an animal or not for a simple NLP task.	8	L2	CO1
	b.	Explain AlexNet's hierarchical architecture and its use in face detection.	6	L2	CO1
	c.	Describe word-vector representation of words. Given the vector for words as follows: King = [-0.9, 1.9, 2.2] Man = [-1.1, 2.4, 3.0] Woman = [-3.2, 2.5, 2.6] Queen = [-3.0, 2.1, 1.7] Explain the process for finding that, vector for queen will be closest to the relation King – Man + Woman = Queen.	6	L2	CO1
		Module – 2			
Q.3	a.	Illustrate with a suitable example, the need for regularization in deep learning.	8	L2	CO2
	b.	Write the mathematical formulation for the following parameter norm penalties: i) Limiting mode capacity ii) L^2 parameter regularization iii) L^1 regularization For each of the above, give the expression for the norm penalty term $\Omega(\theta)$ and explain in each case, the effect of adding these penalties to the learning models. Also write the equations for the following giving explanation of the terms there-in. I. Closed form of Ridge regression II. Soft Thresholding rule for lasso slope solution.	8	L2	CO2

	c.	Explain the need for data augmentation and how it is effective in object recognition.	4	L2	CO2
		OR			
Q.4	a.	Differentiate between Batch Gradient Descent and Minibatch Gradient Descent.	8	L2	CO2
	b.	Write the algorithm for stochastic gradient descent with momentum. Explain the core idea for introducing momentum and how it helps optimization.	8	L2	CO2
	c.	Describe the key mechanics of the Adam Optimization Algorithm.	4	L2	CO2
		Module – 3			
Q.5	a.	Perform full convolution (flip the Kernel) for the image f(x, y) = ③ 2 / 1 4 and the Kernel h(x, y) = ⑦ 6 / 5 8 where the circled values 3 and 7 in the image and kernel indicate their (0, 0) positions.	9	L3	CO3
	b.	The convolution result for an image f(x, y) = ① 2 / 3 4 and Kernel h(x, y) = ⑤ 6 / 7 8 is given as Gshared = ⑤ 16 12 / 22 60 40 / 21 52 32 Perform unshared convolution using the above information.	8	L3	CO3
	c.	In the CNN architecture, the output of the convolution operation is a feature map which is further given as input to an activation function followed by pooling. Given the result of convolution as g(x, y) = 2 3 -2 -3 / 3 10 5 2 / 1 5 5 1 Perform the activation function operation using Rectified Linear Unit (ReLU) followed by Max Pooling (2 × 2, stride 1)	3	L3	CO3
		OR			
Q.6	a.	Compute the output of full cross-correlation (without kernel flipping) for an input image f(x, y) = ④ 2 / 3 1 and a Kernel h(x, y) = ⑧ 6 / 7 5 where the circled values 4 and 8 indicate their (0, 0) positions.	9	L3	CO3

	b.	Compute the result of full tiled convolution (flip the kernels) for an input image $f(x, y) =$ ④ 3 / 2 1 and Kernel $h(x, y) =$ ⑦ 5 / 6 8 where the circled values 4 and 7 indicate their (0, 0) positions. Consider Tile_A = h(x, y) (flipped) and Tile_B = Tile_A + 10	8	L3	CO3
	c.	The result of convolution + ReLU in the CNN workflow is given as shown below: G(CONV + ReLU) = 4 17 21 18 / 9 32 43 30 / 2 10 16 8 Perform the operations of Max Pooling (2 × 2, stride 1) followed by reshaping the output of Max Pooling into a 1D vector suitable to be given to the next stage of the CNN workflow.	3	L3	CO3
		Module – 4			
Q.7	a.	Draw a diagram to show how unfolding a computational graph helps in understanding a Recurrent Neural Network (RNN). For the sequence of three words "I play tennis", show the step by step computation of the basic RNN processing of sequential data using forward propagation. Sequence of three words : I play tennis Where I = 1, play = 2, tennis = 3 Use, i) Input – hidden weight $u_x = 0.5$ ii) Hidden – hidden weight $w_h = 0.8$ iii) Bias b = 0.1 iv) Initial state $h_0 = 0$	10	L3	CO4
	b.	Compare Bidirectional RNN with standard RNN. Compute the Backward pass (←) for the input sequence : "I am thrilled" where I = 1, am = 1, thrilled = 2 Use, i) Initial backward state: hB3 = 0 ii) Backward Input-Hidden weight : $u_B = 0.6$ iii) Backward Hidden-Hidden weight : $W_B = 0.8$ iv) Backward Bias = $0.2 = \beta$	10	L3	CO4
		OR			
Q.8	a.	Describe the roles of encoder and decoder in RNN encoder-decoder architectures. Assume that the final encoder state h_3 for the input sentence : I play cricket = 0.937. If the classification weights per class for the classes [learning, sports, others] is given by $w_y = [w_1, w_2, w_3] = [0.5, 1.5, -0.5]$ and classification biases per class are given as by = $[b_1, b_2, b_3] = [0.0, -0.9, 0.0]$, then decode the input sequence to the class "sports".	10	L3	CO4
	b.	Compare Deep Recurrent Networks and Recursive Neural Networks. Represent the below provided input sentence: "I study Deep Learning" as a tree using Recursive Network concept.	10	L3	CO4

			Module – 5		
Q.9	**a.**	Explain the following common natural language preprocessing steps: i) Stop word removal ii) Stemming	**10**	**L2**	**CO5**
	b.	Explain how high dimensional word vectors are plotted to map them to two or three dimensions.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the following performance metrics of deep learning NLP models: i) The area under the ROC curve ii) The confusion matrix.	**10**	**L2**	**CO5**
	b.	Explain with a toy example, how the ROC Auc metric is calculated.	**10**	**L2**	**CO5**

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BCS755C

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Software Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the different activities of a generic process framework for software engineering.	10	L2	CO1
	b.	With necessary sketches, explain two common evolutionary process models.	10	L2	CO1
		OR			
Q.2	a.	Write a short note on following specialized process model. i) Component Based Development ii) Formal Method Model	10	L2	CO1
	b.	With a neat diagram explain unified process with its different phases.	10	L2	CO1
		Module – 2			
Q.3	a.	Define requirement engineering. Why it is necessary? Explain seven distinct tasks of requirement engineering.	10	L2	CO2
	b.	Develop a use-can template description for safe home system considering home owner as a primary Stake-holder.	10	L3	CO2
		OR			
Q.4	a.	Develop following UML diagrams for access camera surveillance via the internet display camera view function : i) Activity diagram ii) Swimlane diagram	10	L3	CO2
	b.	With suitable examples, explain the data modeling concepts covering data objects, data attributes and relationships.	10	L2	CO2
		Module – 3			
Q.5	a.	Define twelve agility principles for those who want to achieve agility.	10	L2	CO3
	b.	With a neat diagram, explain extreme programming process.	10	L2	CO3
		OR			
Q.6	a.	Write a short note on: i) Scrum ii) Feature Driven Development (FDD)	10	L2	CO3
	b.	Explain the different principles that guide each frame work activity.	10	L2	CO3

		Module – 4			
Q.7	**a.**	With a help of a neat diagram explain translating the requirements model into design model.	**10**	**L2**	**CO4**
	b.	Briefly explain quality guidelines and quality attributes with respect to design process.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Briefly explain the taxonomy of architecture styles.	**10**	**L2**	**CO4**
	b.	Explain the generic structure of architectural context diagram. Also illustrate context diagram for the "Safe Home Security Function".	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Write a short note on: i) Garvin's Quality Dimensions ii) Mc.Call's Duality Factors Features	**10**	**L2**	**CO5**
	b.	Explain a reference model for a technical reviews.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the different object oriented testing strategies.	**10**	**L2**	**CO5**
	b.	In detail explain the control structure testing.	**10**	**L2**	**CO5**

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CBCS SCHEME

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BIS701

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Big Data Analytics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Describe the 3 V's of Big Data and discuss the challenges faced with Big data.	10	L2	CO1
	b.	Explain the classification of digital data.	10	L2	CO1
		OR			
Q.2	a.	Discuss Big Data Analytics and explain the following terminologies : i) Symmetric Multiprocessor System ii) CAP Theorem.	10	L2	CO1
	b.	Explain the features and advantages and NOSQL. Discuss the types of NOSQL data bases.	10	L2	CO1
		Module – 2			
Q.3	a.	Discuss the need for Hadoop and its high level architecture.	10	L2	CO2
	b.	Illustrate MapReduce process with a word count example.	10	L3	CO2
		OR			
Q.4	a.	Discuss the limitation of HDFS and its solution. Explain the YARN architecture.	10	L3	CO2
	b.	Implement a MapReduce program in Java/Python/R to implement matrix multiplication.	10	L4	CO2
		Module – 3			
Q.5	a.	Discuss replication and Sharding in MongoDB.	10	L2	CO3
	b.	Illustrate the CRUD operations using MongoDB query language with examples.	10	L3	CO3
		OR			
Q.6	a.	Demonstrate the following operations in MongoDB query language with examples : i) Count ii) Limit iii) Sort iv) Skip.	10	L2	CO3
	b.	Explain the application of the following in MongoDB i) Cursors ii) Indexes iii) MongoExport iv) Aggregate function.	10	L2	CO3
		Module – 4			
Q.7	a.	Discuss the features of Hive. Explain the Hive architecture.	10	L2	CO3
	b.	Explain the DDL and DML commands in Hive.	10	L2	CO3
		OR			
Q.8	a.	Express the features and philosophy of Pig. Discuss ETL processing.	10	L2	CO3
	b.	Discuss the following in Pig. i. Relational operators – Foreach and Limit ii. Complex data types – Tuple and Map.	10	L2	CO3
		Module – 5			
Q.9	a.	Discuss the features of spark. Explain the spark software stack.	10	L2	CO4
	b.	Explain the steps involved between acquisition of data from multiple sources and its application in spark.	10	L2	CO4
		OR			
Q.10	a.	Discuss text mining and its applications. Explain the process of text minng.	10	L2	CO4
	b.	Implement a word count program in Hadoop and spark using Java/Python/R.	10	L4	CO4

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BIS703

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Information and Network Security

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the basic terminology of crypto along with its black box.	4	L2	CO1
	b.	Explain simple substitution cipher with an example.	8	L3	CO1
	c.	Discuss double transposition cipher with an example.	8	L3	CO1
		OR			
Q.2	a.	Explain modern crypto history.	6	L2	CO1
	b.	Describe the Taxonomy of cryptography.	7	L2	CO1
	c.	Describe the Taxonomy of cryptanalysis.	7	L2	CO1
		Module – 2			
Q.3	a.	Discuss the requirements of a cryptographic hash function.	6	L2	CO2
	b.	Explain Cryptographic Tiger Hash Algorithm.	10	L3	CO2
	c.	Explain the uses of a hash function.	4	L2	CO2
		OR			
Q.4	a.	Define secret sharing. Explain the concept of secret sharing using key escrow.	10	L3	CO2
	b.	Discuss the usage of random numbers with unpredictability.	6	L2	CO2
	c.	Explain the categorization of water marks.	4	L2	CO2
		Module – 3			
Q.5	a.	Define Randomness. Differentiate between deterministic and non-deterministic generators.	10	L2	CO3
	b.	Explain the freshness mechanism in detail.	10	L2	CO3
		OR			
Q.6	a.	Explain the problems related to passwords.	4	L2	CO3
	b.	Describe the dynamic password schemes based on challenge - response.	8	L2	CO3
	c.	Explain the Diffie-Hellman key agreement protocol.	8	L2	CO3

		Module – 4			
Q.7	**a.**	Explain the key life cycle with a neat diagram.	**4**	**L2**	**CO4**
	b.	Discuss key distribution approaches to acquiring shared keys from a KC.	**10**	**L2**	**CO4**
	c.	Explain the key storage risk factor.	**6**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain the fields of X.509 version 3 public-key certificate.	**8**	**L2**	**CO4**
	b.	Explain the public-key certificate management models.	**12**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain simple SSL hand shake protocol.	**10**	**L2**	**CO5**
	b.	Discuss the SSL key management in detail.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Discuss WLAN design issues.	**5**	**L2**	**CO5**
	b.	Explain GSM and UMTS key management.	**10**	**L2**	**CO5**
	c.	Discuss the usage of cryptography in video broadcasting.	**5**	**L2**	**CO5**

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