AJ Institute of Engineering and Technology Mangaluru.

VTU Question Papers

Electronic & Communication Engineering

III to VIII Semester

2022 SCHEME

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CBCS SCHEME

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BEC302

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Digital System Design Using Verilog

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.	Develop a truth table of logic which takes two , 2 – bit binary numbers as its input and generate on output equal to 1, when the sum of the two numbers is odd.	7	L1	CO1
	b.	Convert the following Boolean function into : i) $f(abc) = (\bar{a} + b)(b + \bar{c})$ – Min term canonical form. ii) $f(xyz) = x + \bar{x}\,\bar{z}(y + \bar{z})$ – Max term canonical form.	7	L1	CO1
	c.	List the difference between Prime implicant and Essential prime implicant.	6	L1	CO1
		OR			
Q.2	a.	Simplify the given Boolean function using Quine Mc Cluskey Minimization Technique for the function $R = f(abcd) = \Sigma(0, 1, 2, 6, 7, 9, 10, 12) + dc(3, 5)$.	10	L1	CO1
	b.	Find the minimal sum and minimal product for the given function using K – map method for the function $R = f(abcd) = \Sigma m(0, 1, 3, 7, 8, 12) + dc(5, 10, 13, 14)$.	10	L1	CO1
		Module – 2			
Q.3	a.	List the difference between decoder and encoder and implement full adder using IC – 74138.	10	L3	CO2
	b.	What is Comparator? Design a 2 – bit digital comparator.	10	L3	CO2
		OR			
Q.4	a.	Realize the Boolean function $P = f(wxyz) = \Sigma(0, 1, 5, 6, 7, 10, 15)$ using i) 8 : 1 MUX ii) 4 : 1 MUX.	10	L2	CO2
	b.	With neat logic diagram, explain carry ahead adder.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the working of master slave JK flip flop with help of Logic diagram , Function table , Logic symbol and Timing diagram.	10	L1	CO3
	b.	Obtain the characteristic equation for : i) SR flip - flop ii) J – K – flip - flop iii) D – flip - flop iv) T – flip - flop.	10	L2	CO3
		OR			

Q.6	a.	Design a Synchronous 3 – bit up counter using J K – flip - flop.	10	L4	CO3
	b.	Design a 4 – bit universal shift register using positive edge triggered D – flip - flop and 4 : 1 MUX , to operate as shown in table below : S_1 | S_0 | Register Operation 0 | 0 | - Hold 0 | 1 | - Shift right 1 | 0 | - Shift left 1 | 1 | - Parallel load operation	10	L4	CO3
		Module – 4			
Q.7	a.	Illustrate the structure and verilog module and write a verilog code for Half – adder using structural model.	10	L3	CO4
	b.	What are different types of operators used in HDL with example?	10	L2	CO4
		OR			
Q.8	a.	Illustrate the structure of Data flow description with example.	10	L3	CO4
	b.	Write the syntax of conditional signal assignment statement. Write a code for 4 : 1 MUX using conditional signal statement.	10	L2	CO4
		Module – 5			
Q.9	a.	Write the structure of Verilog behavioral description.	6	L2	CO4
	b.	Write the syntax of IF statement with example.	7	L2	CO4
	c.	Write a code for D – Latch using Behavioral description.	7	L2	CO4
		OR			
Q.10	a.	Write the syntax of While loop statement with example.	10	L2	CO4
	b.	Write a verilog code of a 3 – bit ripple carry adder using Structural description method.	10	L2	CO4

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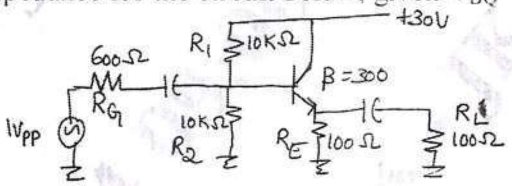
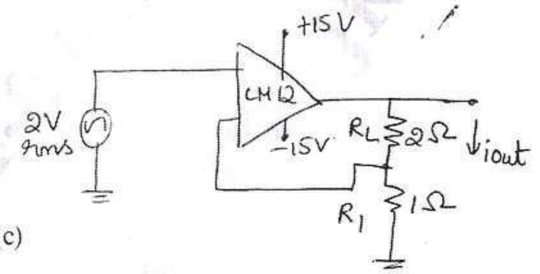
BEC303

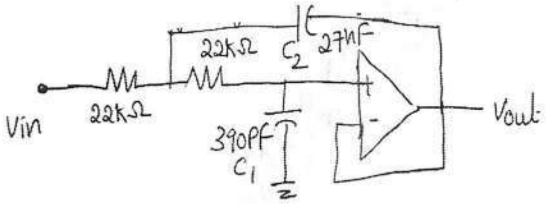
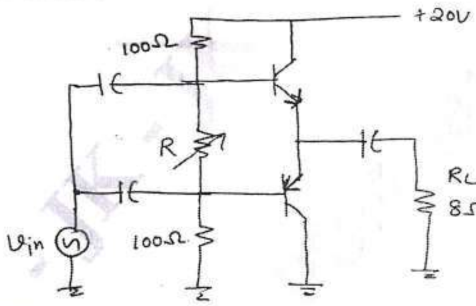
Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Electronic Principles and Circuits

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 simplified analysis of a voltage divider bias circuit of a transistor. Also list the steps in analysis.	8	L1	CO1
	b.	Analyze a VDB Amplifier circuit with respect to DC circuit, AC - π model, AC – T model.	7	L3	CO1
	c.	Design a positive and negative biased clipper circuit.	5	L3	CO1
		OR			
Q.2	a.	With the importance of Coupling capacitor, explain the Base – Biased amplifier circuit. Support your answer with base current , collector current and collector voltage. Also draw its voltage waveforms.	10	L3	CO1
	b.	Explain the basic idea of Common – Collector (CC) amplifier. Give the mathematical relation of AC. Emitter resistance (r_e) , Voltage Gain (A_v) , Input impedance of the base ($Z_{in(base)}$) and Input impedance of the stage ($Z_{in(stage)}$).	6	L2	CO1
	c.	Calculate the output impedance for the circuit below, given V_{BQ} = 15V.  Fig. Q2(c)	4	L2	CO1
		Module – 2			
Q.3	a.	Biasing by fixing V_{GS} is not a good approach to bias a MOSFET. Why? Explain biasing by fixing V_G and connecting a resistance in the source for MOSFET.	8	L2	CO2
	b.	Design a fixed V_G and resistance in the source biasing circuit, to establish drain current I_D = 0.5mA , V_t = 1V , K'_n W/K = 1mA/V^2 , λ = 0. Use power supply V_{DD} = 15V.	5	L3	CO2
	c.	Obtain the transfer and drain characteristics of n – channel MOSFET and calculate Drain resistance (r_d) , Mutual conductance (gm) and Amplification factor (μ).	7	L2	CO2
		OR			
Q.4	a.	Illustrate the development of T – equivalent circuit model for the MOSFET.	6	L2	CO2

	b.	Draw and explain the small signal equivalent model for Common – Source amplifier without source resistance and write the equation for R_{in}, R_{out}, A_V and G_V.	8	L2	CO2
	c.	For a Common Gate (CG) amplifier circuit, given g_m = 1mA/V, R_D = 15kΩ, R_L = 15KΩ, R_{sig} = 50Ω, R_G = 4.7μΩ. Find R_{in}, R_{out}, A_{VO}, A_V and G_V.	6	L2	CO2
		Module – 3			
Q.5	a.	Explain how an Op – amp summer circuit be configured to function as a subtractor.	5	L1	CO3
	b.	How does the design and configuration of an Op – amp R/2R DAC contribute to its accuracy and performance in converting digital signals to analog signals?	8	L2	CO3
	c.	Design and draw the frequency response of common source JFET / MOSFET amplifier.	7	L2	CO3
		OR			
Q.6	a.	Describe the working of inverting Schmitt trigger circuit. How is Schmitt trigger different from regular comparator circuit? Explain with the help of Hysteresis curve.	8	L2	CO3
	b.	Explain the working of Colpitts Oscillator with CE connection.	6	L2	CO3
	c.	Explain the Monostable operation of 555 timers.	6	L2	CO3
		Module – 4			
Q.7	a.	Explain the four types of Negative feedback amplifier.	8	L1	CO4
	b.	Explain the VCVS amplifier. Obtain its exact closed – loop voltage gain and Ideal Closed – Loop Voltage gain. Also define Gain stability, Closed loop input impedance and Closed loop output impedance of a VCVS amplifier.	8	L2	CO4
	c.	Calculate the load power, load current for the given VCIS amplifier circuit.  Fig. Q7(c)	4	L2	CO4
		OR			
Q.8	a.	Explain the Ideal response of filters.	8	L1	CO4

	b.	Determine the pole frequency , Q , Cutoff frequency and 3 – dB frequency, for the filter circuit given below : Fig. Q8(b)  Given $K_0 = 0.99$, $K_C = 1.38$, $K_3 = 1.54$.	5	L2	CO4
	c.	Design a Halfwave and Fullwave precision rectifier using Op – amp.	7	L3	CO4
		Module – 5			
Q.9	a.	Explain class A amplifier , interns of its power gain, Output power , Power dissipation and efficiency.	8	L1	CO5
	b.	Explain class B push pull emitter follower amplifier. How can the crossover distortion be eliminated?	8	L1	CO5
	c.	Calculate the maximum transistor power dissipation and maximum output power for the given circuit. Fig. Q9(c) 	4	L2	CO5
		OR			
Q.10	a.	What is an SCR? With the help of basic SCR circuit, explain the gate triggering.	6	L1	CO5
	b.	Explain the phase control method of TRIAC, along with the voltage waveforms.	7	L1	CO5
	c.	Design a full wave controlled rectifier circuit using RC triggering.	7	L3	CO5

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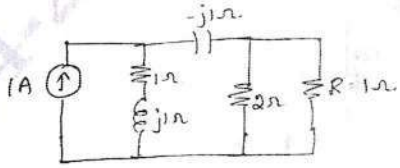
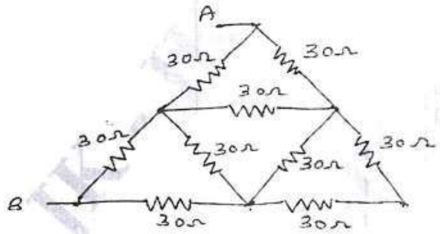
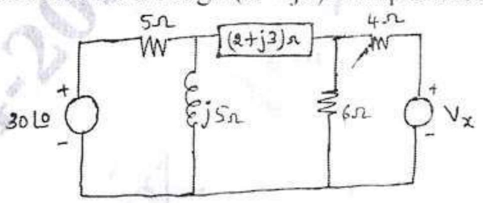
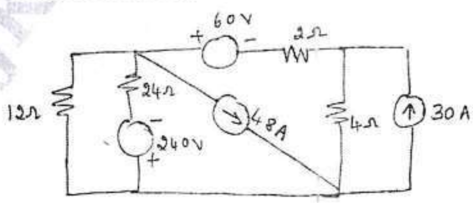
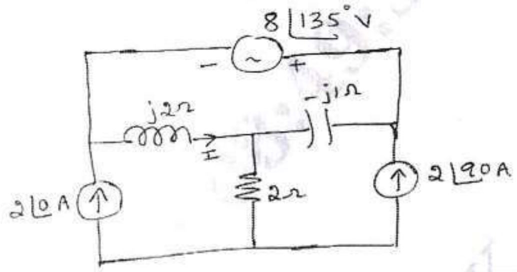
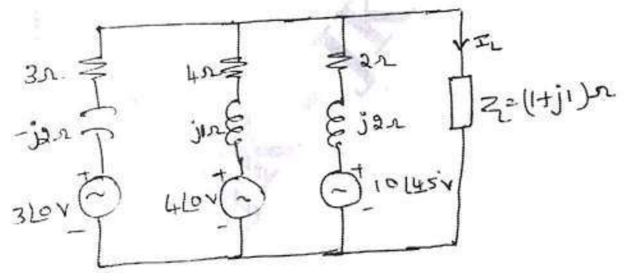
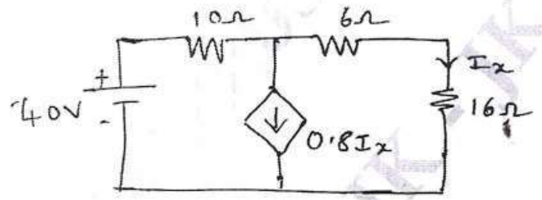
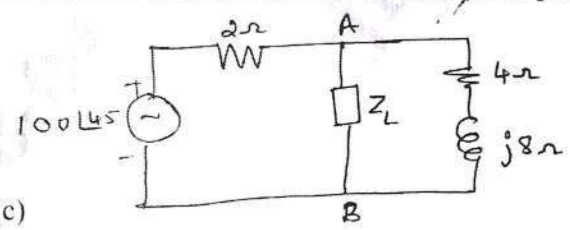
BEC304

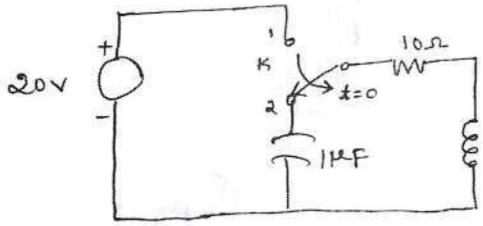
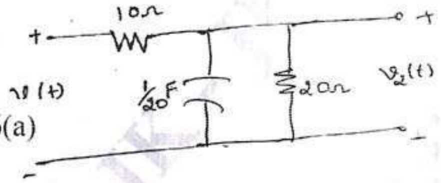
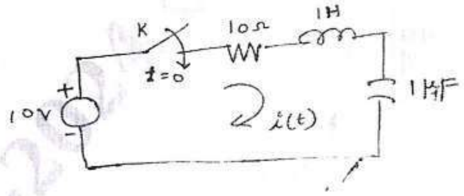
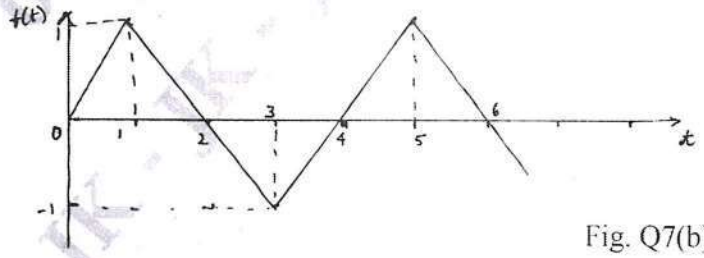
Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Network Analysis

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.

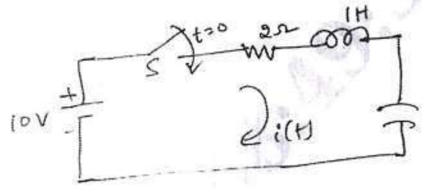
		Module – 1	M	L	C
Q.1	a.	Explain the classification of electrical networks.	8	L2	CO1
	b.	For the network shown in Fig. Q1(b), find the current through load resistor 'R' using loop analysis.  Fig. Q1(b)	6	L3	CO1
	c.	For the network shown in Fig. Q1(c), find the equivalent resistance between the terminals A – B using Star – Delta transformation.  Fig. Q1(c)	6	L3	CO1
		OR			
Q.2	a.	Derive an expression for the equivalent impedances between the terminals for Delta – Star transformation.	6	L2	CO1
	b.	Use modal analysis to find the value of voltage 'V_x' in the circuit shown in Fig. Q2(b), such that the current through $(2 + j3)\Omega$ impedance is zero.  Fig. Q2(b)	7	L3	CO1
	c.	Determine the current through 12Ω resistor shown in Fig. Q2(c), using Source Shifting / Transformation method.  Fig. Q2(c)	7	L3	CO1

		Module – 2			
Q.3	**a.**	Using Superposition theorem, obtain the current 'I' for the network shown in Fig. Q3(a).  Fig. Q3(a)	**10**	**L2**	**CO1**
	b.	Using Millman's theorem, calculate the current through the load in the circuit shown in Fig. Q3(b).  Fig. Q3(b)	**10**	**L3**	**CO2**
		OR			
Q.4	**a.**	State and explain Norton's theorem.	**6**	**L2**	**CO2**
	b.	For the network shown in Fig. Q4(b), find the current through 16Ω resistor using Thevenin's theorem.  Fig. Q4(b)	**7**	**L3**	**CO2**
	c.	For the network shown in Fig. Q4(c), find the value of Z_L for which maximum power transfer occurs. Also find the maximum power.  Fig. Q4(c)	**7**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	Explain the initial and final conditions in basic elements.	**6**	**L2**	**CO3**

	b.	For the circuit shown in Fig. Q5(b), the switch 'K' is changing the position from 1 to 2 at t = 0. Steady state condition has been reached at position 1. Find the value of i , $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$.  Fig. Q5(b)	8	L3	CO3
	c.	Obtain an expression for transient response i(t) of a series R – L circuit when excited by DC supply.	6	L2	CO3
		OR			
Q.6	a.	In the circuit shown in Fig. Q6(a), $v_1(t) = e^{-t}$ for $t \geq 0$ and zero for all $t < 0$. If the capacitor is initially uncharged, determine the value of $v_2(t)$, $\frac{dv_2(t)}{dt}$, $\frac{d^2v_2(t)}{dt^2}$ and $\frac{d^3v_2(t)}{dt^3}$ at $t = 0^+$.  Fig. Q6(a)	10	L3	CO3
	b.	For the circuit shown in Fig. Q6(b), the switch is closed at t = 0. Determine i , $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ and $\frac{d^3i}{dt^3}$ at $t = 0^+$.  Fig. Q6(b)	10	L3	CO3
		Module – 4			
Q.7	a.	State and prove Initial Value Theorem.	6	L2	CO3
	b.	Find the Laplace Transform of the periodic waveform shown in Fig. Q7(b).  Fig. Q7(b)	8	L3	CO3

	c.	Using Laplace transform, determine the current i(t) in the circuit shown in Fig. Q7(c), when the switch 'S' is closed at t = 0. Assume zero initial conditions.	6	L3	CO3

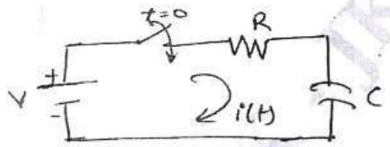
Fig. Q7(c)



OR

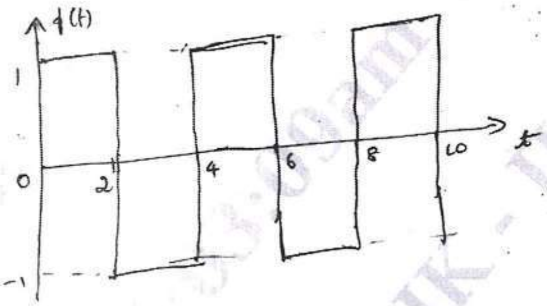
Q.8	a.	State and prove differentiate by 'S' domain property.	6	L2	CO3
	b.	In the circuit shown in Fig. Q8(b), the switch is closed at t = 0. Obtain the expression for the current.	6	L3	CO3

Fig. Q8(b)



	c.	Obtain the Laplace Transform of the square wave shown in Fig. Q8(c).	8	L3	CO3

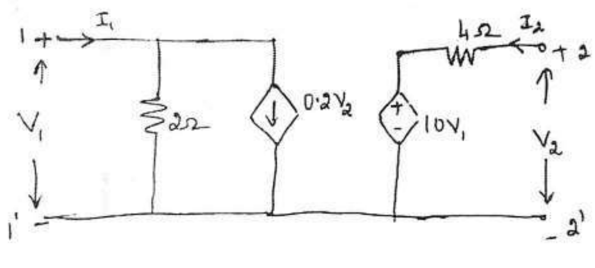
Fig. Q8(c)



Module – 5

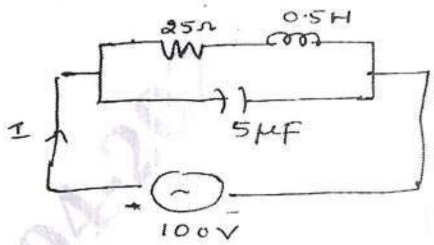
Q.9	a.	What are Impedance and Hybrid parameters? Derive the expression for the same.	8	L2	CO4
	b.	Derive an expression for Transmission parameters interms of Z – parameters.	5	L2	CO4
	c.	For the circuit shown in Fig. Q9(c), find Y – parameters.	7	L3	CO4

Fig. Q9(c)



OR

Q.10	a.	Derive an expression for bandwidth of a series Resonant circuit.	7	L2	CO5

	b.	A series RLC circuit consists of a resistance of 1 kΩ and an inductance of 100mH in series with capacitance of 10PF connected across 100V supply. Determine i) Resonant frequency ii) Quality factor iii) Maximum current in the circuit iv) Bandwidth v) Half power frequencies v) Selectivity factor.	7	L3	CO5
	c.	For the circuit shown in Fig. Q10(c), find i) Resonant frequency ii) Quality factor iii) Bandwidth iv) Impedance at resonance v) Current at resonance.  Fig. Q10(c)	6	L3	CO5

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CBCS SCHEME

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BEC306C

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

Computer Organization and 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.	With a neat diagram, explain basic operational concept of computer.	10	L1	CO1
	b.	Explain following with an example : i) Three address instruction ii) Two-address instruction iii) One-address instruction	06	L1	CO1
	c.	Explain Big Endian and Little Endian with neat diagram.	04	L1	CO1
		OR			
Q.2	a.	Discuss IEEE standard for single precision and double precision floating point numbers with example.	08	L1	CO1
	b.	What is system software? List functions of system software and explain how the processor is shared between user program and os routine.	08	L1	CO1
	c.	Explain computer basic performance equation.	04	L1	CO1
		Module – 2			
Q.3	a.	What is an addressing mode? Explain any five types of addressing modes with example.	10	L1	CO2
	b.	Write a program to add 'n' number using indirect addressing mode.	05	L2	CO2
	c.	Explain stack operations.	05	L2	CO2
		OR			
Q.4	a.	What are assembler directives? Explain various assembler directives used in assembly language program.	08	L2	CO2
	b.	Explain subroutine linkage with an example using linkage register.	06	L2	CO2
	c.	Explain the shift and rotate operations with example.	06	L2	CO2
		Module – 3			
Q.5	a.	Showing register configuration in I/O Interface, Explain program controlled input/output with program.	08	L2	CO2
	b.	Explain the registers involved in DMA interface.	06	L2	CO2
	c.	What is an interrupt? Explain interrupt hardware.	06	L2	CO2
		OR			
Q.6	a.	Explain the following method of handling interrupts from multiple devices. i) Daisy chain method ii) Priority structure	08	L2	CO3
	b.	What is Bus arbitration? Explain centralized bus arbitration mechanism with a neat diagram.	08	L2	CO3
	c.	Explain the concept of vectored interrupt.	04	L2	CO3
		Module – 4			
Q.7	a.	Explain internal organization of 16×8 memory chip.	08	L2	CO4
	b.	With a neat diagram, explain working principle of magnetic disk.	06	L2	CO4
	c.	With a neat diagram, explain virtual memory organization.	06	L2	CO2
		OR			
Q.8	a.	Explain the internal organization of 2M×8 DRAM chip with neat diagram.	08	L2	CO3
	b.	Explain a static RAM cell with a neat diagram.	06	L2	CO3
	c.	Discuss the concept of cache memory.	06	L2	CO3

Module – 5					
Q.9	**a.**	Explain with neat diagram. Single Bus organization of data path inside a processor.	**08**	**L2**	**CO4**
	b.	Discuss the control sequence for execution of instruction ADD (R3), R1.	**06**	**L2**	**CO4**
	c.	Describe the organization of hardwired control unit.	**06**	**L2**	**CO4**
OR					
Q.10	**a.**	Explain multiple bus/three bus organization with a neat diagram.	**10**	**L2**	**CO5**
	b.	What is microprogrammed control? Explain its basic organization with suitable diagram and example.	**10**	**L2**	**CO5**

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CBCS SCHEME

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BEC302

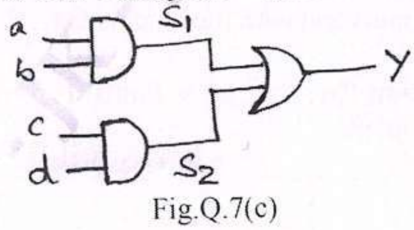
Third Semester B.E./B.Tech. Degree Examination, June/July 2024

Digital System Design using Verilog

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 combinational logic. Give two examples.	4	L1	CO1
	b.	Explain the procedure to place a sum of products equation into canonical form. Express the function P = f(a, b, c) = ab′ + ac′ + bc in canonical form.	6	L2	CO1
	c.	Solve the function K = f(w, x, y, z) = Σ(0, 1, 4, 5, 9, 11, 13, 15) using Karnaugh map.	4	L2	CO1
	d.	Simplify the function F = f(P, Q, R, S) = Σm (0, 3, 5, 6, 7, 11, 14) using Quine-McCluskey method.	6	L2	CO1
		OR			
Q.2	a.	Define canonical sum of products and canonical product of sums. Give examples.	4	L1	CO1
	b.	Explain the procedure to place a product of sums equation into canonical form. Explain the function T = f(a, b, c) = (a + b′) (b′ + c) in canonical form.	6	L2	CO1
	c.	Solve the function G = f(a, b, c, d) = π(0, 4, 5, 7, 8, 9, 11, 12, 13, 15) using Karnaugh map.	4	L2	CO1
	d.	Simplify the function F = f(P, Q, R, S) = Σm(1, 2, 3, 5, 9, 10, 12) using Quine-McCluskey method.	6	L2	CO1
		Module – 2			
Q.3	a.	Define encoder. Write the truth table, equations and circuit diagram of 8 – to – 3 – line priority encoder.	4	L1	CO2
	b.	Explain the concept of carry-lookahead adder with related equations and block diagram.	6	L2	CO2
	c.	Design one-bit comparator with inputs A_i, B_i – bits to be compared, G_i, E_i, L_i – previous stage inputs and with the outputs G_{i+1}, E_{i-1}, L_{i+1}.	6	L4	CO2
	d.	Implement the function f(w, x, y, z) = Σm(0, 1, 5, 6, 7, 9, 12, 15) using 8 – to – 1 – line multiplexer.	4	L3	CO2

		OR			
Q.4	**a.**	Define decoder. Write the truth table, equations and circuit diagram of 3 – to – 8 – line decoder.	4	L1	CO2
	b.	Explain the operation of 8 – to – 1 line multiplexer with block diagram, truth table, equation.	6	L2	CO2
	c.	Construct parallel binary adder/subtractor using full adder block and EX-OR gates. Also explain the operation of it.	6	L3	CO2
	d.	Design two-bit comparator using cascade connection of one-bit comparators and explain its operation.	4	L4	CO2
		Module – 3			
Q.5	**a.**	State transparency property in latches. What is the need for master-slave flip flops?	4	L1	CO3
	b.	With neat block diagram and truth-table explain the operation of master-slave JK flipflop.	6	L2	CO3
	c.	Design a synchronous mod-6 counter using JK flipflops.	6	L4	CO3
	d.	Implement mod-4-ring counter using shift registers.	4	L3	CO3
		OR			
Q.6	**a.**	Define register and shift register. Mention two applications of shift registers.	4	L1	CO3
	b.	With logic diagram and timing diagram explain the operation of positive edge triggered D-flip flop.	6	L2	CO3
	c.	Design a four-bit binary ripple up-counter with logic diagram and counting sequence and briefly explain its operation.	6	L4	CO3
	d.	Implement Mod-8 twisted ring counter using shift registers and write the count sequence.	4	L3	CO3
		Module – 4			
Q.7	**a.**	List the different relational operators available in verilog language.	4	L1	CO4
	b.	Explain different verilog data types with examples.	6	L2	CO4
	c.	For the circuit diagram shown in Fig.Q.7(c), develop a verilog program for the output Y in: i) data flow description ii) behavioral description.  Fig.Q.7(c)	6	L3	CO4

	d.	Develop a verilog program to implement 2 × 1 multiplexer using conditional operator. Also write the truth table of 2 × 1 multiplexer.	4	L4	CO4
		OR			
Q.8	a.	List the different styles of descriptions in verilog programming.	4	L1	CO4
	b.	Explain verilog shift operators and arithmetic shift operators with examples.	6	L2	CO4
	c.	Let A = 5′b11011, B = 5′b10101, C = 4′d3. Determine the output of the following verilog program statements: i) d = &A ii) e = ~^ 4′b1011 iii) f = ~(A & (~B)) iv) g = A‖B v) b = 3 ** 2 vi) i = {2{A}}.	6	L3	CO4
	d.	Develop a verilog program for half subtractor using data flow description style by providing truth table and expressions.	4	L4	CO4
		Module – 5			
Q.9	a.	Write the verilog format of if-else statement and explain it.	4	L1	CO4
	b.	Explain the operation of positive triggered JK flipflop by writing verilog code using case statement and truth table.	6	L2	CO4
	c.	Develop a verilog behavioral description code for calculating the factorial of positive integers.	6	L3	CO4
	d.	Develop a verilog program for D-latch using behavioral description style by providing truth table.	4	L4	CO4
		OR			
Q.10	a.	Write the verilog format of case statement and explain it.	4	L1	CO4
	b.	Explain the operation of 2-to-1-line multiplexer by writing verilog structural description program and block diagram.	6	L2	CO4
	c.	Develop a verilog behavioral description code for three-bit binary up counter.	6	L3	CO4
	d.	Develop a verilog program for half adder using structural description style by providing truth table and expressions.	4	L4	CO4

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CBCS SCHEME

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

BEC303

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Electronic Principles and Circuits

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.	With a neat circuit diagram, explain the voltage divider biasing circuit and also derive the expression.	10	L3	CO1
	b.	What is the collector-emitter voltage in Fig.Q1(b)	10	L3	CO1

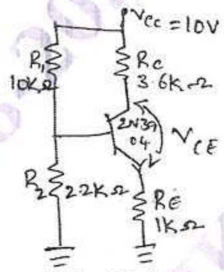

Fig.Q1(b)

			M	L	C
		OR			
Q.2	a.	With diagram explain the two transistors model. Also derive Z_{in}(base).	10	L3	CO1
	b.	Explain the base biased amplifier circuit. Also explain AC equivalent circuit.	10	L3	CO1
		Module – 2			
Q.3	a.	With diagram explain the enhancement model MOSFET. Draw Drain and Transconductance curve.	10	L3	CO2
	b.	Derive an expression of $i_D - V_{DS}$ relationship of NMOS transistor.	10	L3	CO2
		OR			
Q.4	a.	Derive an expression of DC bias point and voltage gain of small signal operation of MOSFET.	10	L3	CO2
	b.	With a neat diagram explain the MOSFET T-equivalent circuit.	10	L3	CO2
		Module – 3			
Q.5	a.	With diagram explain the R-2R ADC converter derive V_{out}.	10	L3	CO3
	b.	Derive V_{ref} and f_c of comparators with non zero reference to linear Amplifier.	10	L3	CO3
		OR			
Q.6	a.	With neat diagram explain the operational amplifier base wein bridge oscillator circuit.	10	L3	CO3
	b.	Explain the operation of RC phase shift oscillator.	10	L3	CO3
		Module – 4			
Q.7	a.	Briefly explain the four types of negative feedback.	10	L3	CO4
	b.	With diagram explain the ICVS amplifier circuit.	10	L3	CO4
		OR			
Q.8	a.	With diagram explain the passband and stopband attenuation.	10	L3	CO4
	b.	Explain with circuit diagram of VCVS High pass filter.	10	L3	CO4
		Module – 5			
Q.9	a.	With neat diagram explain the DC and AC two load line of VDB amplifier.	10	L3	CO5
	b.	Derive an expression of A_p of Class A power amplifier.	10	L3	CO5
		OR			
Q.10	a.	With circuit and waveform explain the 1-ϕ RC triggering circuit.	10	L3	CO5
	b.	With neat diagram explain the Triac – Diac based bidirectional phase control circuit using SCR.	10	L3	CO5

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CBCS SCHEME

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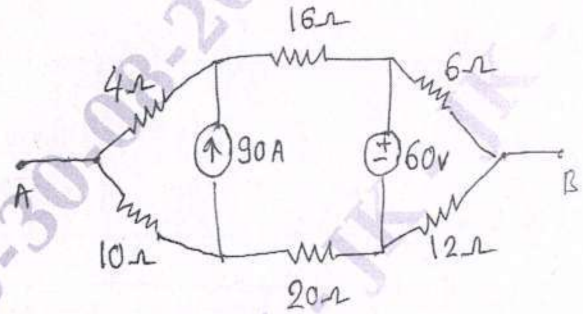
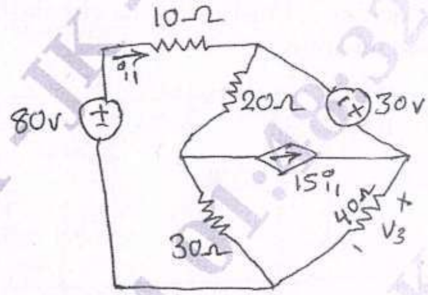
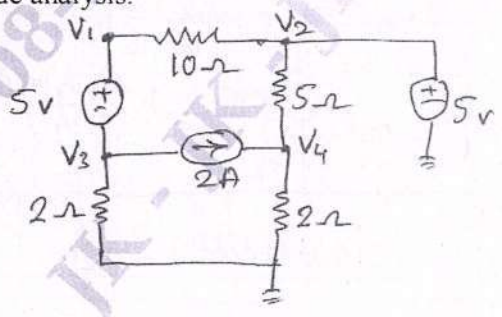
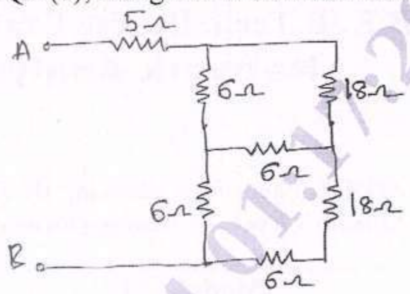
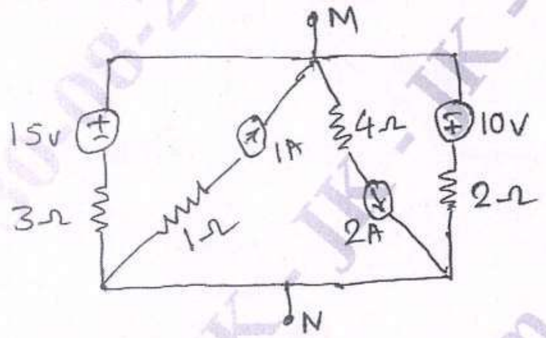
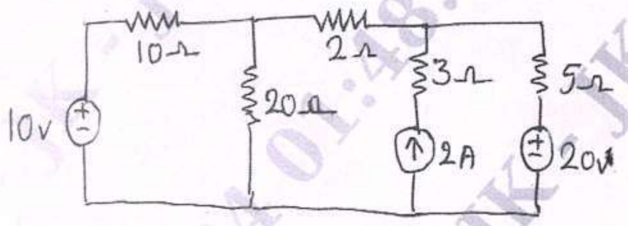
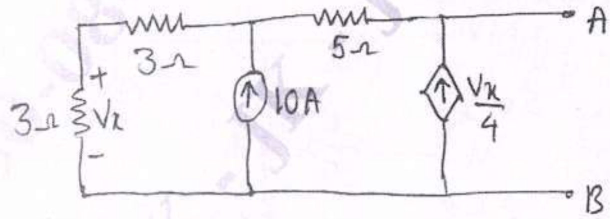
BEC304

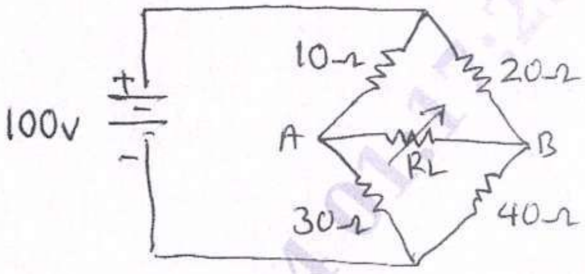
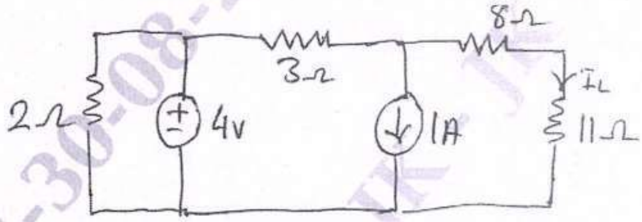
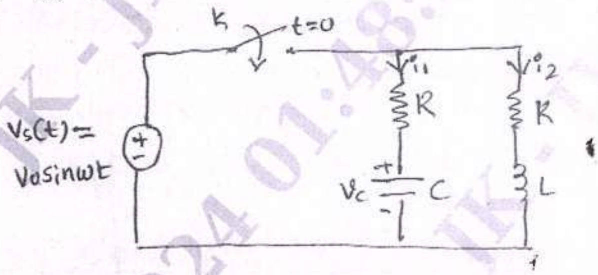
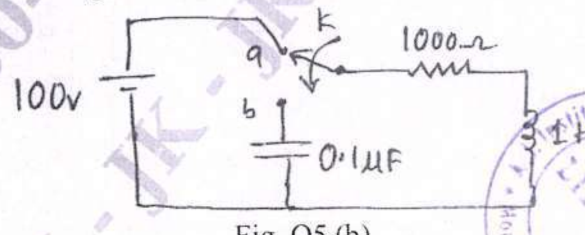
Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Network Analysis

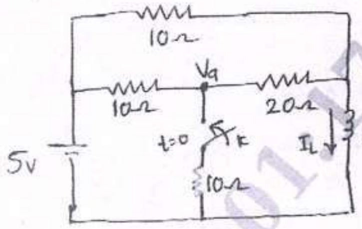
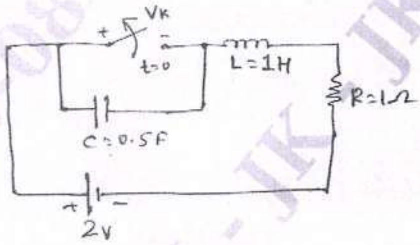
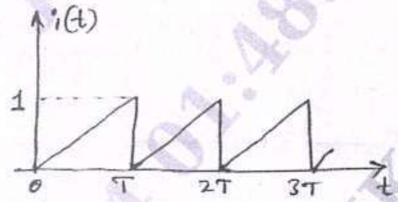
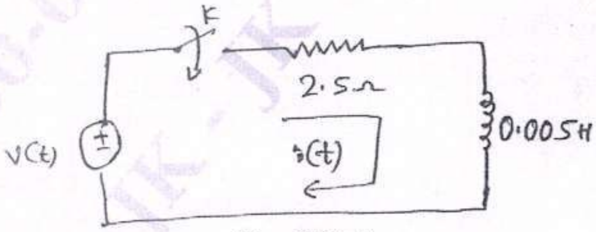
Time: 3 hrs. Max. Marks: 100

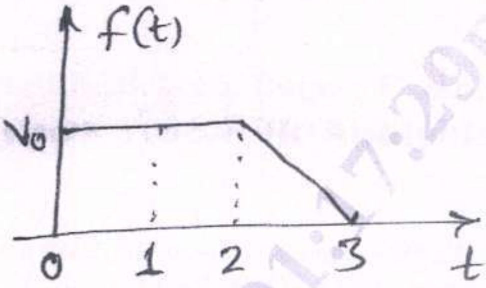
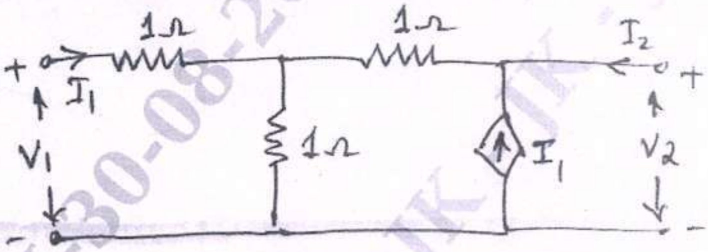
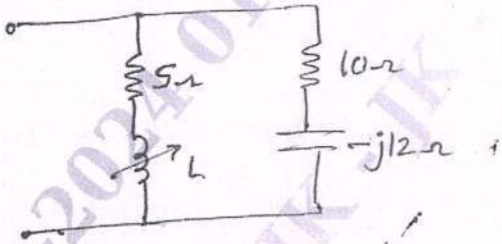
Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Reduce the network shown in Fig. Q1 (a) to a single voltage source in series with resistance between terminals A and B. Use source transformation and source shifting technique.  Fig. Q1 (a)	10	L3	CO1
	b.	Determine voltage V_3 in the circuit shown in Fig. Q1 (b), using loop analysis.  Fig. Q1 (b)	10	L3	CO1
		OR			
Q.2	a.	For the network shown in Fig. Q2 (a), compute all node voltages V_1, V_2, V_3 and V_4 using Node analysis.  Fig. Q2 (a)	8	L3	CO1

	b.	Determine the equivalent resistance between terminal A and B, in the network shown in Fig. Q2 (b), using star Delta transformation.  Fig. Q2 (b)	7	L3	CO1
	c.	Find the potential difference between terminals M and N in the network shown in Fig. Q2 (c), using source transformation.  Fig. Q2 (c)	5	L3	CO1
		Module – 2			
Q.3	**a.**	Determine the voltage across 2Ω resistor in the circuit shown in Fig. Q3 (a), using the super position theorem.  Fig. Q3 (a)	10	L3	CO2
	b.	Find Thevenin's equivalent at terminal A and B, in the network shown in Fig. Q3 (b).  Fig. Q3 (b)	10	L3	CO2

		OR			
Q.4	**a.**	Determine the load resistance to receive maximum power from the source. Also find the maximum power delivered to the load in the circuit shown in Fig. Q4 (a).  Fig. Q4 (a)	**8**	**L3**	**CO2**
	b.	For the circuit shown in Fig. Q4 (b), determine current I_L using Norton's theorem.  Fig. Q4 (b)	**8**	**L3**	**CO2**
	c.	State Millman's theorem.	**4**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	In the network shown in Fig. Q5 (a), a switch K is closed at t = 0. Determine $\frac{di_1}{dt}$, $\frac{di_2}{dt}$ at $t = 0^+$.  Fig. Q5 (a)	**10**	**L3**	**CO3**
	b.	In the Network shown in Fig. Q5 (b), the switch K is changed position from a to b at t = 0. Solve for i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$. The circuit is reached steady state before switching.  Fig. Q5 (b)	**10**	**L3**	**CO3**

		OR			
Q.6	**a.**	In the network shown in Fig. Q6 (a), steady state has been reached with switch K open. At time t = 0, the switch is closed. Deteremine the value of $V_a(0^-)$ and $V_a(0^+)$ at $t = 0^+$.  Fig. Q6 (a)	10	L3	CO3
	b.	In the network shown in Fig. Q6 (b), a steady state is reached with switch K closed. At t = 0, switch is opened. Determine voltage across switch V_K, $\frac{dV_K}{dt}$ at $t = 0^-$.  Fig. Q6 (b)	10	L3	CO3
		Module – 4			
Q.7	**a.**	State and prove initial and final value theorem in Laplace transformation.	10	L3	CO3
	b.	Obtain the Laplace transform of the waveform shown in Fig. Q7 (b). Assume that waveform is periodic.  Fig. Q7 (b)	10	L3	CO3
		OR			
Q.8	**a.**	In the series RL circuit shown in Fig. Q8 (a), the source voltage is $V(t) = 50 \sin 250t$ V. Using Laplace transform determine the current i(t) when switch K is closed at t = 0.  Fig. Q8 (a)	10	L3	CO3

	b.	Find Laplace transform of the waveform shown in Fig. Q8 (b).  Fig. Q8 (b)	10	L3	CO3
		Module – 5			
Q.9	a.	Find Z and ABCD parameters for the network shown in Fig. Q9 (a). Also verify whether network is Reciprocal or Symmetrical.  Fig. Q9 (a)	10	L3	CO4
	b.	A series RLC circuit has a resistance of 10 Ω, an inductance of 0.3 H and a capacitance of 100 μF. The applied voltage is 230 V. Find Resonance frequency, lower and upper cut-off frequencies, current at resonance, current at f_1 and f_2, voltage across inductance at resonance.	10	L3	CO4
		OR			
Q.10	a.	Derive Z-parameters in terms of H parameter.	8	L3	CO4
	b.	Find the value of L for which the circuit resonates at frequency of 1000 rad/sec, for the circuit shown in Fig. Q10 (b).  Fig. Q10 (b)	7	L3	CO4
	c.	Derive the relation between resonating frequency and half power frequencies i.e. $f_r = \sqrt{f_1 f_2}$	5	L2	CO4

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CBCS SCHEME

USN | | | | | | | | | | | **BEC306C**

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

Computer Organization and 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.**	With a neat diagram, describe the functional units of a computer. Give examples for I/O.	**10**	**L2**	**CO1**
	b.	Write assembly language program for X = (A * B) + (C * D) using one address, two address, and three address instructions formats.	**06**	**L3**	**CO1**
	c.	Explain the Bus structures.	**04**	**L2**	**CO1**
		OR			
Q.2	**a.**	With a neat diagram, discuss the operational concepts in a computer highlighting the role of PC, MAR, MDR, IR.	**10**	**L2**	**CO1**
	b.	Discuss IEEE standard for single precision and double precision floating point numbers with standard notations.	**06**	**L3**	**CO1**
	c.	Distinguish between Big-endian and Little-endian memory assignment. With a neat sketch, show how the value 26789435 is stored using these methods.	**04**	**L3**	**CO1**
		Module – 2			
Q.3	**a.**	Define addressing mode. Explain any five addressing mode with syntax and examples.	**10**	**L2**	**CO2**
	b.	What is subroutine? With a pseudocode or program segment illustrate parameter passing using register.	**05**	**L2**	**CO2**
	c.	Explain various assembler directives used in assembly language program.	**05**	**L2**	**CO2**
		OR			
Q.4	**a.**	Explain stack operation with an example.	**10**	**L2**	**CO2**
	b.	Explain the shift and rotate operations with examples.	**06**	**L2**	**CO2**
	c.	Write a program to add 'n' number using indirect addressing mode.	**04**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	Showing the possible registers configuration in I/O interface. Explain program controlled input/output.	**10**	**L2**	**CO3**
	b.	Explain in detail the situations where a number of devices capable of initiating interrupts are connected to processor. How to resolve the problems?	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	What is an interrupt? With an example illustrate the concept of interrupt.	**10**	**L2**	**CO3**
	b.	Explain the Register involved in a DMA interface to illustrate DMA.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Illustrate internal structure of static memory.	**10**	**L2**	**CO4**
	b.	With a neat diagram, explain virtual memory organization.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Classify memory in a computer. With a neat diagram, describe the organization of 2M × 8 DRAM chip.	**10**	**L2**	**CO4**
	b.	Briefly explain secondary storage devices.	**06**	**L2**	**CO4**
	c.	Explain use of a cache memory.	**04**	**L2**	**CO4**

		Module – 5			
Q.9	**a.**	List different ways of improving CPU performance. With a neat diagram, discuss three-bus organization of CPU.	**10**	**L2**	**CO5**
	b.	Discuss Hardwired control unit organization with relevant diagrams and illustrate the logic to generate Z_{in} control signal.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Explain single-bus organization of data path in a processor with neat diagram, highlight the importance of gating signals.	**10**	**L2**	**CO5**
	b.	Develop the complete control signal sequence for the instruction Add(R_1), R_3 with appropriate remarks.	**06**	**L3**	**CO5**
	c.	Discuss micro programmed control unit design with relevant diagrams.	**04**	**L2**	**CO5**

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CBCS SCHEME

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BEC401

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

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.	State and explain spherical coordinate system in detail.	5	L2	CO1
	b.	Four point charges each of 10 μC are placed in free space at the points (1, 0, 0), (-1, 0, 0), (0, 1, 0) and (0, -1, 0) m respectively. Determine the force on a point charge of 30 μC located at a point (0, 0, 1) m.	8	L3	CO1
	c.	Show that electric field intensity at a point, due to 'n' number of point charges, is given by, $E=\frac{1}{4\pi\varepsilon_0}\sum_{i=1}^{n}\frac{Q_i}{R_i^2}a_{R_i}$ V/m	7	L3	CO1
		OR			
Q.2	a.	Define electric field intensity. Derive the expression for electric field intensity due to infinite line charge.	9	L1	CO1
	b.	Given the two points $A(\rho=4.4, \phi=-115^\circ, Z=2)$ and B(x = -3.1, y = 2.6, z = -3), find (i) The rectangular coordinate of point A (ii) The cylindrical coordinate of point B (iii) The distance between A and B.	5	L3	CO1
	c.	Find E at P(1, 5, 2) m in free space if a point charge of 6 μC is located at (0, 0, 1), the uniform line charge density $\rho_L = 180$ nC/m along x axis.	6	L3	CO1
		Module – 2			
Q.3	a.	State and prove Gauss's law for point charge.	6	L3	CO2
	b.	Calculate the divergence of D at the point specified if, (i) $D=(2xyz-y^2)a_x+(x^2z-2xy)a_y+x^2ya_z$ C/m² at P_A (2, 3, -1) (ii) $D=2\rho Z^2\sin^2\phi a_\rho+\rho Z^2\sin 2\phi a_\phi+2\rho^2 Z\sin^2\phi a_z$ C/m² at $P_B(\rho=2, \phi=110^\circ, Z=-1)$ (iii) $D=2r\sin\theta\cos\phi a_r+r\cos\theta\cos\phi a_\theta-r\sin\phi a_\phi$ C/m² at $P_C(r=1.5, \theta=30^\circ, \phi=50^\circ)$	9	L3	CO2
	c.	Find electric field intensity at the point A(1, 2, -1) given the potential $V=3x^2y+2y^2z+3xyz$	5	L3	CO2
		OR			
Q.4	a.	Evaluate both sides of divergence theorem if $D=\frac{5r^2}{4}a_r$ C/m² in spherical co-ordinate for the volume enclosed by r = 4 m and $\theta=\frac{\pi}{4}$ radians.	8	L3	CO2

	b.	Calculate the work done in moving a charge 4C from B(1, 0, 0) to A(0, 2, 0) along the path $y = 2 - zx$, $z = 0$ in the field (i) $E = 5a_x$ V/m (ii) $E = 5xa_x$ V/m (iii) $E = 5xa_x + 5ya_y$ V/m	6	L3	CO2
	c.	Electrical potential at an arbitrary point in free space is given as, $V = 2(x+1)^2(y+2)^2(z+3)^2$ volt at a point P(2, -1, 4). Find (i) V (ii) E (iii) $\lvert E \rvert$ (iv) $\lvert D \rvert$ (v) ρ_V	6	L3	CO2
Module – 3					
Q.5	a.	Evaluate the expression for capacitance of two uniformly charged parallel planes of infinite extent.	8	L2	CO3
	b.	Determine whether or not the potential equations satisfies Laplaces equation : (i) $V = 2x^2 - 4y^2 + z^2$ (ii) $V = \phi\cos\phi + z$ (iii) $V = r^2\cos\phi + \theta$	5	L3	CO3
	c.	An assembly of two concentric spherical shell is considered. The inner spherical shell is at a distance of 0.1 m and is at a potential of 0 volts. The outer spherical shell is at a distance of 0.2 m and at a potential of 100 V. The medium between them is a free space. Find E and D using spherical co-ordinate system.	7	L3	CO3
OR					
Q.6	a.	State and explain Biot-Savarts law applicable to magnetic field.	6	L2	CO3
	b.	Evaluate both sides of the stokes theorem for the field, $H = 6xya_x - 3y^2a_y$ A/m and the rectangular path around the region, $2 \le x \le 5$, $-1 \le y \le 1$, $Z = 0$. Let the positive direction of ds be a_z.	8	L3	CO3
	c.	Let $A = (3y - z)a_x + 2xza_y$ wb/m in a certain region of free space. (i) Show that $\nabla.A = 0$ (ii) At P(2, -1, 3) find A, B, H and J.	6	L3	CO3
Module – 4					
Q.7	a.	Obtain the expression for magnetic force between differential current elements.	6	L1	CO4
	b.	The point charge $Q = 18nC$ has a velocity of 5×10^6 m/s in the direction $a_V = 0.60a_x + 0.75a_y + 0.30a_z$. Calculate the magnitude of force exerted on the charge by the field. (i) $B = -3a_x + 4a_y + 6a_z$ mT (ii) $E = -3a_x + 4a_y + 6a_z$ KV/m	6	L3	CO4
	c.	The magnetization in a magnetic material for which $\chi_m = 8$ is given in a certain region as $150\,Z^2a_x$ A/m. At Z = 4 cm, find the magnitude of, i) J_T ii) J iii) J_b.	8	L3	CO4
OR					
Q.8	a.	Obtain the magnetic boundary conditions at interface between two different magnetic material.	8	L2	CO4
	b.	Two differential current elements $I_1dl_1 = 10^{-4}a_z$Am at P_1(1, 0, 0) and $I_2dl_2 = 3\times10^{-6}(-0.5a_x+0.4a_y+0.3a_z)$ Am at P_2(2, 2, 2) are located in free space. Find the vector force exerted on, (i) I_2dl_2 by I_1dl_1 (ii) I_1dl_1 by I_2dl_2	6	L3	CO4

	c.	The interface between two different regions is normal to one of three Cartesian axes. If $B_1 = \mu_0(43.5a_x + 24.0a_z)$ and $B_2 = \mu_0(22a_x + 24a_z)$. What is the ratio $\frac{\tan\theta_1}{\tan\theta_2}$?	6	L3	CO4
		Module – 5			
Q.9	a.	For the given medium $\varepsilon = 4\times10^{-9}$ F/m and $\sigma = 0$. Find K so that the following pair of fields satisfies Maxwell's equation, $E = (20y - Kt)a_x$ V/m, $H = (y+2\times10^6 t)a_z$ A/m.	6	L3	CO5
	b.	Within a certain region $\varepsilon = 10^{-11}$ F/m and $\mu = 10^{-5}$ H/m, If $B = 2\times10^{-4}\cos10^5 t \sin10^{-3} y$ T ; (i) Find E (ii) Find total magnetic flux passing through the surface x = 0, 0 < y < 40 m, 0 < z < 2m at t = 1 μsec.	8	L3	CO5
	c.	State and explain pointing theorem.	6	L2	CO5
		OR			
Q.10	a.	Derive the modified Ampere's law by Maxwells for time varying fields.	5	L2	CO5
	b.	Show that the intrinsic impedance of the perfect dielectric $\eta = \frac{\lvert E\rvert}{\lvert H\rvert} = \sqrt{\frac{\mu}{\varepsilon}}$ and show that its value in free space is 377 Ω	7	L2	CO5
	c.	A plane electromagnetic wave having a frequency of 10 MHz has an average pointing vector of 1 W/m². If medium is lossless with relative permeability of 2 and relative permittivity of 3 find (i) The velocity of propagation. (ii) Wavelength. (iii) Impedance of the medium (iv) rms electric field.	8	L3	CO5

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CBCS SCHEME

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

BEC402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Principles of Communication 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.	What is conditional probability? Prove that $P\left(B/A\right) = P\left(A/B\right) \cdot P(B)/P(A)$	05	L2	CO1
	b.	Define the autocorrelation and cross correlation. Discuss the properties of autocorrelation.	10	L2	CO1
	c.	Develop a program to generate the probability density function of Gaussian distribution function.	05	L3	CO1
		OR			
Q.2	a.	Define auto-covariance, random variable, cumulative distribution function and probability distribution function.	08	L1	CO1
	b.	The random variable its plot is given as $f_x(x) = 2.e^{-2x}$ for $x \geq 0$. Find the probability that it will take value between 1 and 3.	04	L3	CO1
	c.	Define probability with an example. Discuss their properties (axioms).	08	L2	CO1
		Module – 2			
Q.3	a.	Explain amplitude modulation with necessary equations and sketches in time domain and frequency domain.	08	L3	CO2
	b.	Define modulation index and percentage of modulation. Explain over modulation and distortion.	06	L2	CO2
	c.	Derive the expression for Amplitude Modulation (AM) power in terms of modulation index.	06	L2	CO1
		OR			
Q.4	a.	Explain a general block diagram of a frequency division multiplexing.	06	L1	CO2
	b.	Explain the working principle of lattice type balanced modulator with circuit diagram.	07	L1	CO2
	c.	With neat diagrams, explain high level collector modulator.	07	L2	CO2
		Module – 3			
Q.5	a.	With a neat block diagram, explain converting a phase modulated signal into a frequency modulated signal.	07	L1	CO3
	b.	Determine the frequency modulated signal $v_{FM} = V_C \sin(2\pi f_c t + m_f \sin 2\pi f_m t)$ interms of Bessel functions. Write the amplitude of sideband frequencies (J_n) interms of modulation index (m_f).	06	L3	CO3
	c.	Identify the noise suppression of frequency modulated signal.	07	L2	CO3
		OR			
Q.6	a.	What is the maximum bandwidth of an FM signal with a deviation of 30 kHz and a maximum modulating signal of 5 kHz. (i) Using number of sidebands N = 9 (ii) Using Carson's rule	04	L2	CO3
	b.	Define phase locked loop. Explain with neat circuit diagram of FM demodulator using the IC 565.	08	L2	CO3
	c.	With neat block diagram, explain the concept of frequency modulation with an IC voltage controlled oscillator (IC NE566)	08	L2	CO3

		Module – 4			
Q.7	**a.**	Why digitize the analog signals? Explain the different processes used to convert the analog signal to digital signal.	**06**	**L2**	**CO4**
	b.	What is quantization process? Explain the different types of quantization with their important characteristics.	**07**	**L2**	**CO4**
	c.	Explain the concept of Time division multiplexing with a neat block diagram.	**07**	**L2**	**CO4**
		OR			
Q.8	**a.**	Define PCM (Pulse Code Modulation). Explain the basic elements of a PCM system with neat diagrams.	**06**	**L2**	**CO4**
	b.	For the data stream 01101001. Draw the following line code waveforms: (i) Unipolar NRZ (ii) Polar NRZ (iii) Unipolar RZ (iv) Bipolar RZ (v) Manchester code (vi) Differential coding	**09**	**L3**	**CO4**
	c.	State and prove the sampling theorem. Explain with neat sketches and equations.	**05**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Develop a code to generate and plot eye diagram.	**06**	**L3**	**CO5**
	b.	Define noise factor and noise figure. Also explain noise in cascade connection.	**06**	**L2**	**CO5**
	c.	Define Inter Symbol Interference (ISI). Outline baseband binary data transmission system with neat block diagram and equations.	**08**	**L1**	**CO5**
		OR			
Q.10	**a.**	Explain bandwidth requirements of TI systems.	**06**	**L1**	**CO5**
	b.	Write short notes on: (i) Signal to noise ratio (ii) External noise (iii) Internal noise	**08**	**L1**	**CO5**
	c.	An RF amplifier has an S/N ratio of 8 at the input and an S/N ratio of 6 at the output. What are the noise factor, noise figure and noise temperature?	**06**	**L3**	**CO5**

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CBCS SCHEME

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

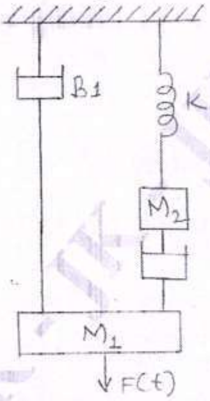
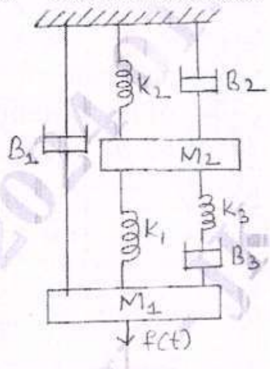
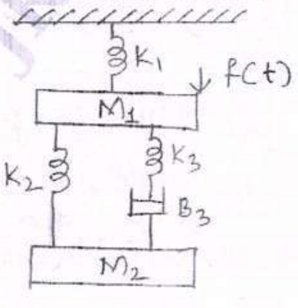
BEC403

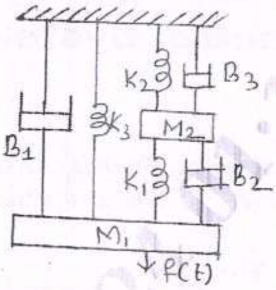
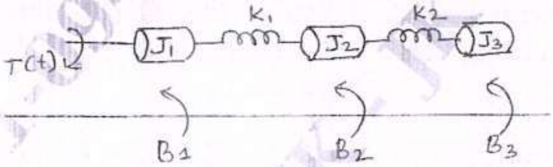
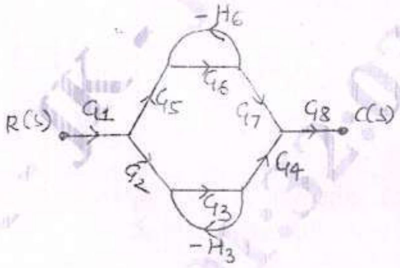
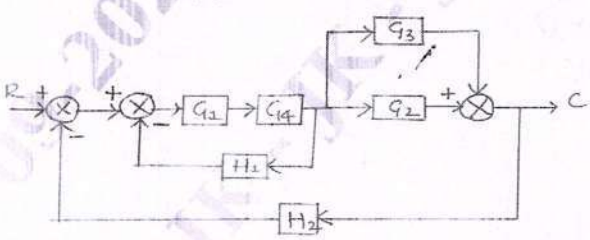
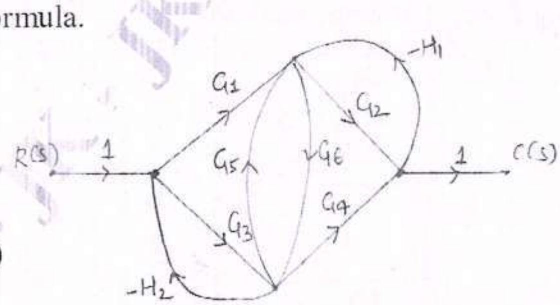
Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024

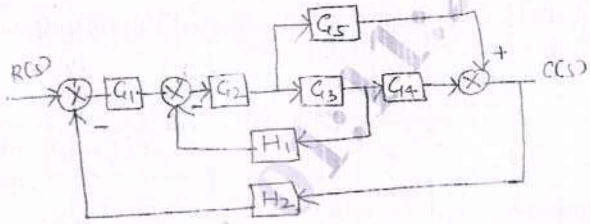
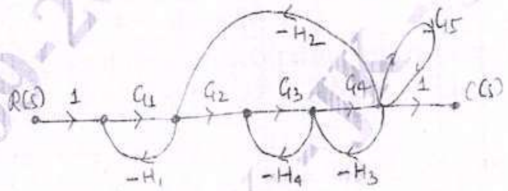
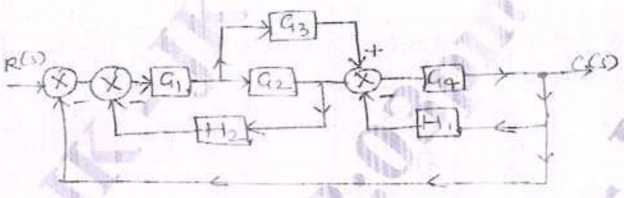
Control Systems

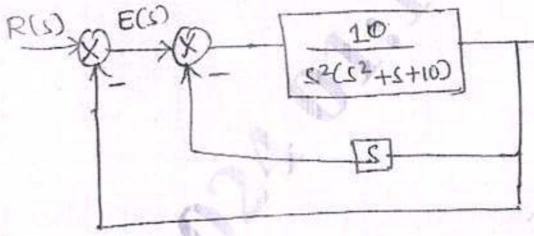
Time: 3 hrs. Max. Marks: 100

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 Control system. Write down any four differences between Open Loop Control System and Closed Loop Control System.	4	L2	CO1
	b.	For the mechanical system shown in Fig. Q1(b), obtain the equivalent electrical system using Force – Voltage method.  Fig. Q1(b)	8	L2	CO1
	c.	For the mechanical system, shown in Fig. Q1(c), obtain the equivalent electrical system using Force – Current method.  Fig. Q1(c)	8	L2	CO1
		OR			
Q.2	a.	For the mechanical system shown in Fig. Q2(a), obtain the equivalent electrical system using Force – Voltage method.  Fig. Q2(a)	7	L2	CO1

	b.	For the mechanical system shown in Fig. Q2(b), obtain the equivalent electrical system using Force – Voltage method.  Fig. Q2(b)	7	L2	CO1
	c.	Draw the electrical network based on torque – current analogy and write performance equation for the mechanical system of Fig. Q2(c).  Fig. Q2(c)	6	L2	CO1
		Module – 2			
Q.3	a.	Find $\frac{C(s)}{R(s)}$ by Mason's gain formula for Fig. Q3(a).  Fig. Q3(a)	6	L3	CO3
	b.	Determine the transfer function $\frac{C(s)}{R(s)}$ of the system shown in Fig. Q3(b).  Fig. Q3(b)	6	L3	CO3
	c.	For the single flow graph of Fig. Q3(c), find the transfer function using Mason's gain formula.  Fig. Q3(c)	8	L3	CO3

		OR			
Q.4	**a.**	Reduce the block diagram to its canonical form and obtain C(s)/R(s) of the system of Fig. Q4(a).  Fig. Q4(a)	6	L3	CO3
	b.	Obtain the transfer function of the single flow graph shown in Fig. Q4(b), using Mason's gain formula.  Fig. Q4(b)	6	L3	CO3
	c.	Reduce the block diagram of Fig. Q4(c) to its simple form and obtain C(s)/R(s).  Fig. Q4(c)	8	L3	CO3
		Module – 3			
Q.5	**a.**	With the help of graphical representation and mathematical expression, explain the following test signals : i) Step signal ii) Ramp signal iii) Impulse signal iv) Parabolic signal.	8	L3	CO2
	b.	Find Kp , Kv , Ka and steady state error for a system with Open loop transfer function $G(s)\,H(s) = \dfrac{10(s+2)(s+3)}{s(s+1)(s+4)(s+5)}$, where $r(t) = 3 + t + t^2$.	6	L3	CO2
	c.	The Open loop transfer function of a servo system with unity feedback is given as $G(s) = \dfrac{10}{s(0.1s+1)}$. Find out static error constants and obtain steady state error when an input $r(t) = A_0 + A_1 t + \dfrac{A_2}{2} t^2$ is applied.	6	L3	CO2
		OR			
Q.6	**a.**	For a unity feedback control system with $G(s) = \dfrac{64}{s(s+9.6)}$, write the output response to a unit step input. Determine 1) The response at t = 0.1 set 2) Maximum value of response and the time at which it occurs. 3) Settling time.	10	L2	CO3

	b.	For the system shown in Fig. Q6(b), 1) Identify the type of C(s) / E(s) 2) Find values of Kp , Kv , Ka. 3) If r(t) = 10u(t), find steady state value of the output.  Fig. Q6(b)	10	L2	CO3
		Module – 4			
Q.7	a.	Find the number of roots with positive real part, zero real part and negative real part for a system $s^6 + 4s^5 + 3s^4 - 16s^2 - 64s - 48 = 0$.	6	L2	CO4
	b.	For a unity feedback system, $G(s) = \frac{K}{s(1+0.4s)(1+0.25s)}$, find range of values of K, Marginal value of K and frequency of sustained oscillations.	6	L2	CO4
	c.	Explain the angle condition in Root locus. Test the following points using angle condition for the system $G(s)\,H(s) = \frac{K}{s(s+2)(s+4)}$. i) s = - 0.75 ii) s = -1 + j4.	8	L2	CO4
		OR			
Q.8	a.	Sketch the complete root locus and comment on the stability of the system $G(s)\,H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$.	12	L2	CO4
	b.	Sketch the Bode plot for the transfer fl. Find value of 'K' for $W_{gc} = 5$ rad/sec. $G(s) = \frac{K s^2}{(1+0.2s)(1+0.02s)}$	8	L2	CO4
		Module – 5			
Q.9	a.	For a certain control system $G(s)\,H(s) = \frac{K}{s(s+2)(s+10)}$, sketch the Nyquist plot and hence calculate the range values of K for stability.	10	L2	CO5
	b.	Explain the Lag compensator and Lead compensator with the help of a circuit diagram.	10	L2	CO5
		OR			

Q.10	a.	Construct the state model using phase variables if the system is described by the differential equation $\frac{d^3y(t)}{dt^3} + 4\frac{d^2y(t)}{dt^2} + 7\frac{dy(t)}{dt} + 2y(t) = 5u(t)$. Also draw the state diagram.	6	L2	CO5
	b.	The transfer function of a control system is $\frac{Y(s)}{U(s)} = \frac{s^2+3s+4}{s^3+2s^2+3s+2}$. Obtain the State model using signal flow graph.	7	L2	CO5
	c.	Find the state transition matrix for $A = \begin{bmatrix} 0 & -1 \\ +2 & -3 \end{bmatrix}$	7	L1	CO5

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CBCS SCHEME

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BEC405A

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.	Bring out the difference between Microprocessor and Microcontroller.	6	L2	CO1
	b.	With a neat Architecture diagram, explain the Architecture of 8051 Microcontroller.	10	L2	CO1
	c.	Explain : (i) RST (ii) INT Pins of 8051	4	L1	CO1
		OR			
Q.2	a.	Differentiate between CISC and RISC.	6	L2	CO1
	b.	With a neat diagram, explain the Internal Memory Structure and Programming Model of 8051 Microcontroller.	10	L2	CO1
	c.	List out special features of 8051 Microcontroller.	4	L2	CO1
		Module – 2			
Q.3	a.	Define Addressing Mode. Explain different addressing modes with example.	10	L2	CO2
	b.	Write an ALP to add two 16-bit numbers loaded in R_1R_0 and R_3R_2. Store the result in R_6R_5 and R_4 from MSB to LSB.	10	L3	CO2
		OR			
Q.4	a.	Define Stack. Explain the operation of Stack using Stack Pointer, PUSH and POP Instructions.	10	L2	CO2
	b.	Write an ALP to find largest of N numbers.	10	L3	CO2
		Module – 3			
Q.5	a.	Explain : (i) TMOD (ii) TCON register of 8051.	10	L2	CO3
	b.	Assume XTAL = 22 MHz. Write an ALP to generate a square of frequency 1 kHz on Pin P1.2.	10	L2	CO3
		OR			
Q.6	a.	Explain : (i) SCON register (ii) Importance of TI Flag	10	L2	CO3
	b.	Write a C program to transfer "YES" serially at 9600 baud rate, 8 bit data, 1 stop bit, do this continuously.	10	L3	CO3
		Module – 4			
Q.7	a.	Define Interrupt. List the steps involved in Executing an Interrupt.	10	L2	CO4
	b.	Explain Interrupt Vector table of 8051 Microcontroller.	5	L2	CO4
	c.	Explain Interrupt enable register.	5	L2	CO4
		OR			
Q.8	a.	Explain Interrupt Control used in 8051.	10	L2	CO4
	b.	Explain the steps involved in programming serial communication Interrupt.	5	L2	CO4

	c.	Explain how multiple Interrupts are handled in 8051.	5	L2	CO4
Module – 5					
Q.9	a.	Explain DAC Interface with a neat diagram and also write a program to generate staircase waveform.	10	L3	CO5
	b.	With a neat diagram, write a program to Interface Stepper Motor to 8051 Microcontroller.	10	L3	CO5
OR					
Q.10	a.	Explain the Interfacing of DC motor using C programming.	10	L3	CO5
	b.	With a neat diagram, write a ALP to Interface LCD to 8051 Microcontroller.	10	L3	CO5

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CBCS SCHEME

USN | | | | | | | | | | | **BEC302**

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Digital System Design using Verilog

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.	Design a combinational logic truth table so that an output is generated indicating when a majority of four inputs is tree.	4	L3	CO1
	b.	Find the prime implicants and the essential prime implicants of the following Boolean functions using Karnaugh maps. i) $f(a, b, c, d) = \Sigma(1, 5, 6, 7, 11, 12, 13, 15)$ ii) $f(a, b, c, d) = \Sigma(0, 1, 4, 5, 9, 11, 13, 15)$	8	L4	CO1
	c.	Simplify the given boolean function using Quine McCluskey minimization technique for the function $O = f(a, b, c, d) = \Sigma(0, 1, 2, 3, 6, 7, 8, 9, 14, 15)$	8	L3	CO1
		OR			
Q.2	a.	Place the following equations into the proper canonical form: i) $P = f(a, b, c) = ab' + ac' + bc$ ii) $G = f(w, x, y, z) = w'x + yz'$	4	L3	CO1
	b.	Find the minimal sum and minimal product for the following Boolean functions using Karnaugh maps i) $f(a,b,c,d) = \bar{a}\bar{b}d + bcd + a\bar{b}d + b\bar{c}\bar{d}$ ii) $f(a,b,c,d) = (a+\bar{b})(a+c+d)(\bar{a}+\bar{b}+\bar{d})(a+\bar{c}+d)$	8	L4	CO1
	c.	Simplify the given boolean function using quine. McCluskey minimization technique for the function. $s = f(a,b,c,d) = \Sigma(1,3,13,15) + \Sigma d(8,9,10,11)$	8	L3	CO1
		Module – 2			
Q.3	a.	Design and explain binary full adder with block diagram, Karnaugh map and logic circuit.	10	L3	CO2
	b.	Define decoder, write the symbol, truth table and logic circuit for 3:8 line decoder using minterm generator.	10	L2	CO2
		OR			
Q.4	a.	Define multiplexer, write the symbol, truthtable and logic circuit for 4:1 multiplexer using enable input.	10	L2	CO2
	b.	Realize the Boolean function $f(w, x, y, z) = \Sigma(0, 1, 5, 6, 7, 9, 12, 15)$ i) Using 8:1 MUX ii) Using 4:1 MUX	10	L2	CO2

		Module – 3			
Q.5	**a.**	Develop the characteristic equation for i) SR flip flop ii) JK flip flop iii) D flip flop iv) T flip flop.	**10**	**L3**	**CO3**
	b.	Explain serial in, parallel at unidirectional shift register and parallel in serious out unidirectional shift register.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Explain Mod-4 ring counter and Mod-8 twisted ring counter with logic diagram and counting sequence.	**10**	**L2**	**CO3**
	b.	Design a synchronous Mod-6 counter using clocked D-flip flop.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain logical operators and relational operators used in verilog.	**8**	**L2**	**CO4**
	b.	Illustrate i) NETS ii) Register iii) Vector iv) integer data types with an example.	**8**	**L2**	**CO4**
	c.	Write a verilog code for full adder using data flow description style.	**4**	**L2**	**CO4**
		OR			
Q.8	**a.**	Illustrate the structure of behavioural description with an example using half adder.	**8**	**L2**	**CO4**
	b.	Illustrate the structure of verilog module with an example using half subtractor.	**8**	**L2**	**CO4**
	c.	Write a verilog code for binary to gray using behavioural description style.	**4**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Write the syntax of IF and EISE-IF with an example.	**8**	**L2**	**CO4**
	b.	Write logic symbol, flowchart and program for D-latch using behavioural description style.	**8**	**L2**	**CO4**
	c.	Write a verilog code for 8:1 MUX using behavioural description style.	**4**	**L2**	**CO4**
		OR			
Q.10	**a.**	Explain the structure of structural model with built in gates using example of half adder. Also mention an primitive built in gates.	**8**	**L2**	**CO4**
	b.	Write a verilog code of a 3-bit ripple carry adder using structural description model.	**8**	**L2**	**CO4**
	c.	Write a verilog code of SR flip flop using behavioural description style.	**4**	**L2**	**CO4**

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CBCS SCHEME

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BEC303

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Electronic Principles and Circuits

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.	Derive expressions V_{in}, V_{out} and A_Y for a common emitter circuit with ac equivalent circuit with π – model.	12	L1	CO2
	b.	What is the voltage gain and output voltage across the load resistor of V_{DB} amplifier? $R_1 = 10\ k\Omega$, $R_2 = 2.2\ k\Omega$, $R_C = 3.6\ k\Omega$, $R_E = 1\ k\Omega$, $R_L = 10\ k\Omega$, $V_{CC} = 10\,V$, $V_{BE} = 0.7\,V$ and $V_{in} = 2\ mV$.	8	L1	CO1
		OR			
Q.2	a.	With a neat diagram, explain loading effect of input impedence.	10	L1	CO1
	b.	Explain three types of Bias circuit, (i) Emitter feedback bias. (ii) Collector feedback bias and (iii) Collector and emitter feedback.	10	L1	CO1
		Module – 2			
Q.3	a.	Explain the three biasing methods to bias MOS amplifiers with neat circuit diagram.	10	L2	CO2
	b.	Explain the T-equivalent circuit model of MOSFET.	10	L3	CO2
		OR			
Q.4	a.	With a small signal equivalent model of MOSFET, derive an expression of voltage gain and transconductance.	10	L2	CO2
	b.	Explain common source follower and derive the expression of voltage gain with necessary equation.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain R and 2R resistor Digital to Analog converter and also derive the expression of output voltage.	10	L2	CO3
	b.	With a neat circuit diagram, explain the operation of Monostable multivibrator.	10	L2	CO3
		OR			
Q.6	a.	With a neat diagram, explain operation of RC-phase shift oscillator using op-amp. Write the expression for frequency of oscillations.	8	L2	CO3
	b.	With a net diagram, explain operation of crystal oscillator using BJT and Write necessary equations.	6	L2	CO3
	c.	A crystal has these values $L = 3\ H$, $C_S = 0.05\ PF$, $R = 2\ k\Omega$ and $C_m = 10\ PF$. What are the series and parallel resonant frequencies of the crystal?	6	L3	CO3

Module – 4					
Q.7	**a.**	Explain the first order Low Pass filter with frequency response.	**10**	**L2**	**CO4**
	b.	Explain the two types of Band Pass filters.	**10**	**L2**	**CO4**
OR					
Q.8	**a.**	Explain the four types of Negative feedback circuits.	**10**	**L2**	**CO4**
	b.	Explain the working of 2[nd] order high pass filter with a neat circuit and frequency response.	**10**	**L2**	**CO4**
Module – 5					
Q.9	**a.**	Explain two load lines with necessary circuit diagram and equations.	**10**	**L2**	**CO5**
	b.	With a neat diagram, explain the working of a Thyristor.	**10**	**L2**	**CO5**
OR					
Q.10	**a.**	Explain Basic Construction and working of IBGTs with necessary figure.	**10**	**L2**	**CO5**
	b.	With a neat diagram, explain the working of UJT relaxation oscillator.	**10**	**L2**	**CO5**

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CBCS SCHEME

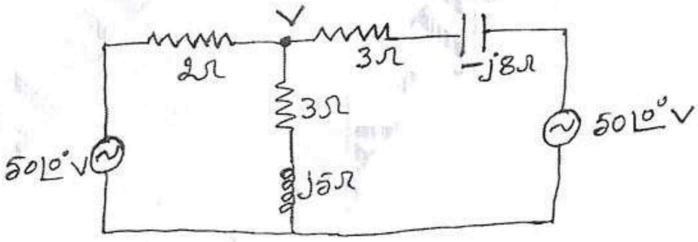
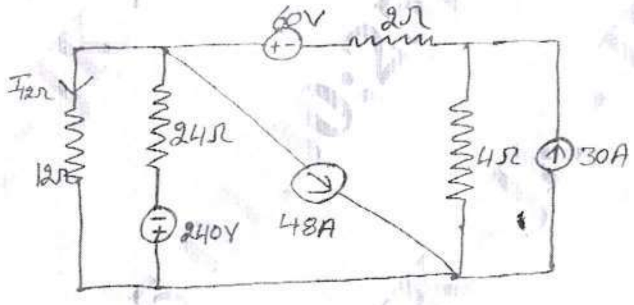
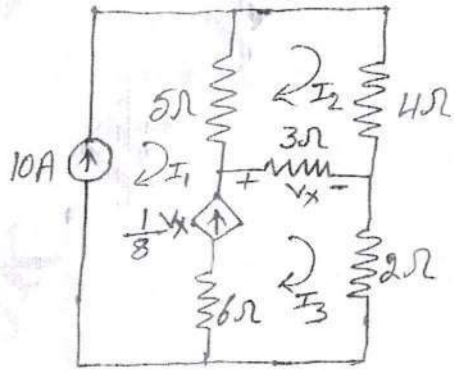
USN | | | | | | | | | | |

BEC304

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Network Analysis

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.	Three impedances are connected in Delta. Obtain the star equivalent of the network.	7	L3	CO1
	b.	For the circuit shown in Fig. Q1(b). Find the voltage 'V' at node by using nodal analysis. Fig. Q1(b) 	6	L3	CO1
	c.	Determine the current in 12Ω resistor shown in Fig. Q1(c) using source transformation method. Fig. Q1(c) 	7	L3	CO1
		OR			
Q.2	a.	Find the loop currents I_1, I_2, and I_3 in the circuit shown in Fig. Q2(a). Fig. Q2(a) 	7	L3	CO1

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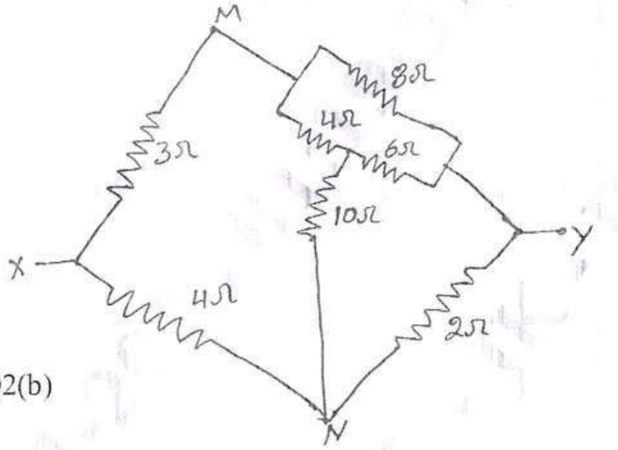
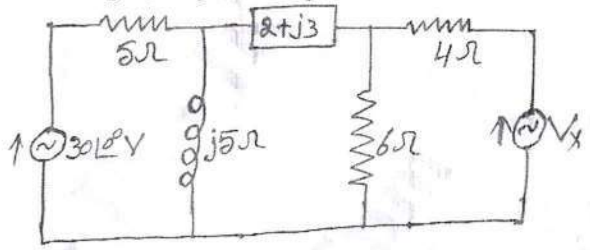
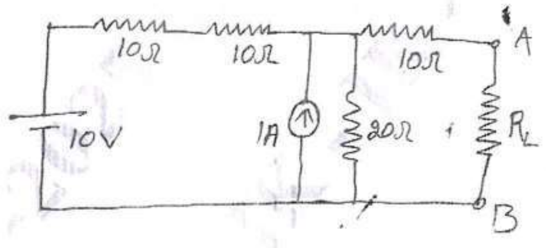
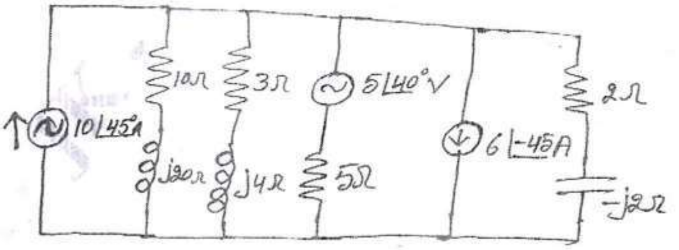
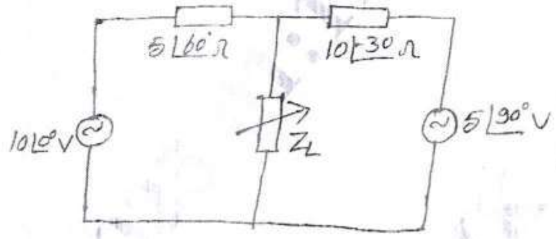
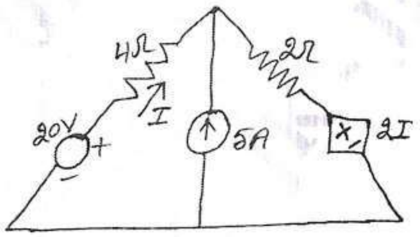
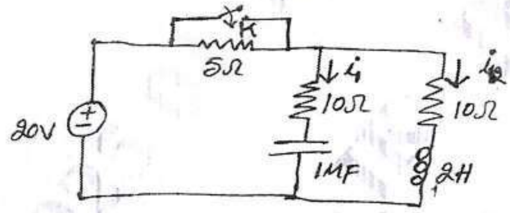
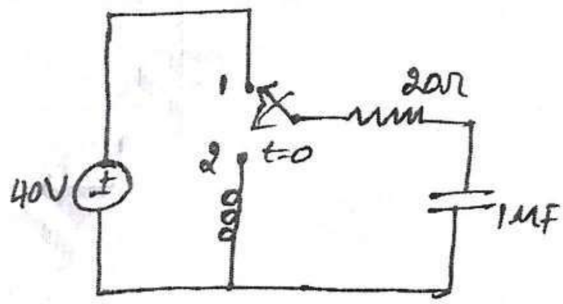
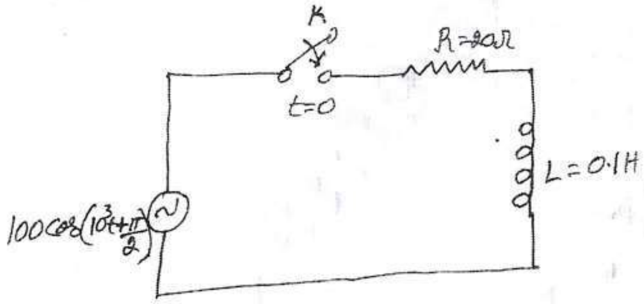
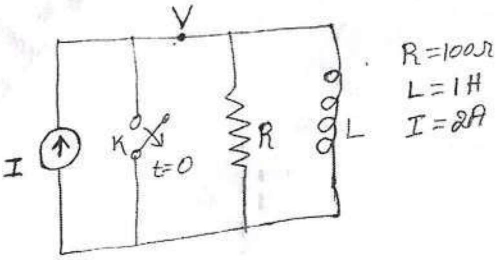
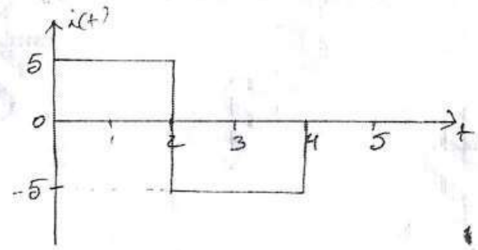
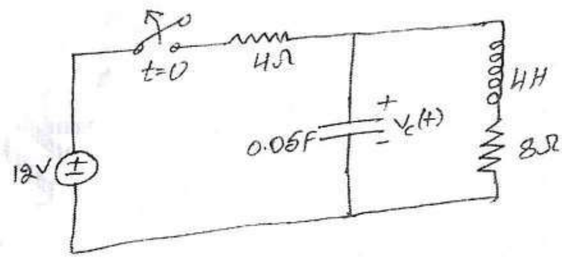
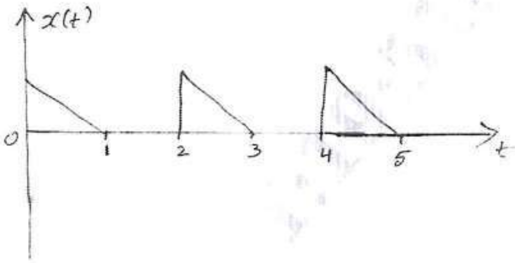
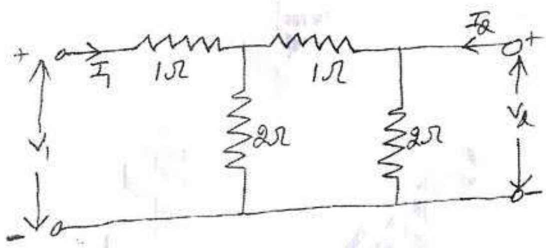
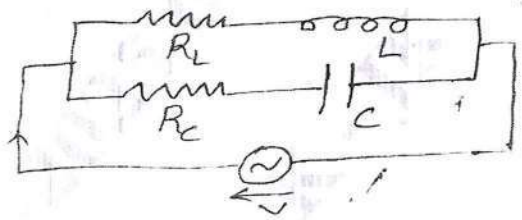
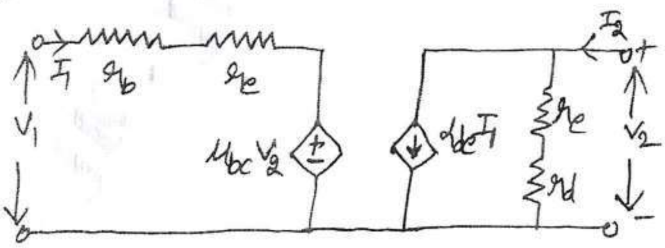
	b.	Determine the resistance between the terminals X, Y using star delta transformation in the network shown in Fig. Q2(b).  Fig. Q2(b)	6	L3	CO1
	c.	Use the nodal analysis to find the value of V_X and the circuit shown in Fig. Q2(c). Such that the current through (2 + j3) Ω Impedance is zero.  Fig. Q2(c)	7	L3	CO1
		Module – 2			
Q.3	**a.**	Sate and prove Superposition theorem.	7	L2	CO2
	b.	For the circuit shown in Fig. Q3(b), obtain the Thevenin's equivalent circuit.  Fig. Q3(b)	7	L3	CO2
	c.	Using Millman's theorem, find current flowing through (3 + j4) Ω impedance for the circuit shown in Fig. Q3(c).  Fig. Q3(c)	6	L3	CO2
		OR			

Q.4	a.	State and prove Norton's theorem.	7	L2	CO2
	b.	Find the value of Z_L for Maximum Power transfer and the value of Maximum power for the circuit shown in Fig. Q4(b).  Fig. Q4(b)	6	L3	CO2
	c.	Find current 'I' using Super position theorem for the circuit shown in Fig. Q4(c).  Fig. Q4(c)	7	L3	CO2
		Module – 3			
Q.5	a.	Use the concepts of initial condition to illustrate the voltage behavior in inductor circuit for DC supply.	6	L3	CO3
	b.	In the circuit steady state is reached with switch 'K' open. The switch is closed at t = 0. Compute i , di/dt and d^2i/dt^2 at t = 0^+.  Fig. Q5(b)	7	L3	CO3
	c.	The switch is moved from position (1) to position (2) at t = 0. The steady state has been reached before switching. Computer i , di/dt and d^2i/dt^2 at t = 0^- for Fig. Q5(c).  Fig. Q5(c)	7	L4	CO3
		OR			

Q.6	**a.**	In the circuit shown in Fig. Q6(a), determine complete solution for current when switch 'K' is closed at t = 0. Fig. Q6(a) 	10	L3	CO3
	b.	Compute v , dv/dt , d^2v/dt^2 at t = 0^+ for the circuit shown in below Fig. Q6(b), when the switch K is opened at t = 0. Fig. Q6(b) 	10	L4	CO3
		Module – 4			
Q.7	**a.**	Using waveform synthesis method to express the voltage pulse interms of unit step. Find i) L{i(t)} ii) L{∫ i(t).dt}. Fig. Q7(a) 	8	L3	CO4
	b.	State and prove initial value and final value theorem for Laplace transform.	6	L2	CO4
	c.	Obtain the Laplace transform of step and ramp function with relevant expressions.	6	L3	CO4
		OR			
Q.8	**a.**	Determine $i_L(t)$ for t ≥ 0 using Laplace transform for circuit shown in Fig. Q8(a). Fig. Q8(a) 	10	L3	CO4

	b.	Find the Laplace transform of the periodic signal x(t) as shown in Fig. Q8(b). Fig. Q8(b) 	10	L3	CO4
		Module – 5			
Q.9	a.	Define Z – parameters. Determine Y parameters interms if Z – parameters.	6	L3	CO5
	b.	Show that resonant frequency is geometric mean of cut off frequency in series R – L – C circuit.	7	L3	CO5
	c.	Apply the two – port network analysis technique to determine ABCD – parameters of the network shown in Fig. Q9(c). Fig. Q9(c) 	7	L3	CO5
		OR			
Q.10	a.	Derive the expression for the resonant frequency of the circuit shown in Fig. Q10(a). Also show that the circuit resonate at all frequency if $R_L = R_C = \sqrt{\frac{L}{C}}$. Fig. Q10(a) 	10	L3	CO5
	b.	The model of a transistor in the CE mode is shown in Fig. Q10(b). Determine the h – parameters. Fig. Q10(b) 	10	L3	CO5

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CBCS SCHEME

USN | | | | | | | | | | | **BEC306A**

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Electronic Devices

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 different types of bonding forces in solids with the help of neat diagram and examples.	06	L2	CO1
	b.	With neat diagram, explain direct and indirect semiconductor.	06	L2	CO1
	c.	A resistance of copper wire (diameter = 1.03 mm) is 6.15 Ω per 305 m. The concentration of free electrons in copper is 8.4×10^{28} electrons/m^3, if the current is 2A. Find drift velocity, mobility and conductivity.	08	L3	CO1
		OR			
Q.2	a.	Show the random thermal motion of an electron in a solid and what happens when electric field is applied? Derive the equation which relates the current density and mobility in a semiconductor in an applied electric field.	10	L3	CO1
	b.	What is Hall effect in semiconductor? Obtain an expression for mobility interms of Hall coefficient and resistivity.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the qualitative description of current flow at equilibrium, forward and reverse bias junction of a diode using energy band diagram.	10	L2	CO2
	b.	Explain zener break down and Avalanche break down under reverse bias condition.	10	L2	CO2
		OR			
Q.4	a.	Derive an expression for current and voltage in an illuminated junction.	08	L3	CO2
	b.	Explain the structure and operation of solar cell with I-V characteristics.	08	L2	CO2
	c.	A solar cell has a short circuit current of 100 mA and open circuit voltage of 0.8 V under full solar illumination fill factor is 0.7. What is maximum power delivered to load by this cell?	04	L3	CO2
		Module – 3			
Q.5	a.	Discuss the operation of PNP transistor in normal active mode indicating various components of current flow and current direction.	10	L2	CO3
	b.	Explain how BJT acts as amplifier with the help of equation.	10	L2	CO3
		OR			
Q.6	a.	Derive Eber's moll modes for Assymetric Transistor (Coupled diode model).	10	L2	CO3
	b.	Explain specification for switching transistor BJT with suitable diagram.	05	L2	CO3
	c.	Explain the effect of base narrowing with neat diagram.	05	L2	CO3
		Module – 4			
Q.7	a.	Explain the construction, working and characteristics of n-JFET with neat diagram and equations.	10	L2	CO4
	b.	Explain with neat diagram, ideal C-V characteristics of MOS capacitor with P-Type substrate.	10	L2	CO4

		OR			
Q.8	**a.**	Draw and explain small signal equivalent circuit of n-channel JFET. Ideal low frequency small signal equivalent circuit with and without r_s.	**10**	**L2**	**CO4**
	b.	Explain the construction, working and characteristics of n-channel enhancement MOSFET, with neat diagram and equations.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain Ion-implantation process with neat diagram.	**08**	**L2**	**CO5**
	b.	Explain photolithography process.	**08**	**L2**	**CO5**
	c.	Mention the difference between dry etching and wet etching.	**04**	**L1**	**CO5**
		OR			
Q.10	**a.**	Explain the evolution of ICs over the years.	**10**	**L2**	**CO5**
	b.	Explain integration of other circuit elements with suitable diagrams.	**10**	**L2**	**CO5**

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CBCS SCHEME

USN | | | | | | | | | | | **BEC401**

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

Electromagnetic Theory

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.	State and explain Coulomb's law of force between two point charges in vector form.	8	L1	CO1
	b.	Define Electric field intensity. Derive the expression for the electric field intensity at a point due to infinite line charges (Uniformly charged wire).	8	L2	CO1
	c.	Two very small conducting spheres, each of mass $1 \times 10\text{-}4$ kg are suspended at common point by very thin filaments of length 0.2m. A charge Q Coulomb is placed on each sphere. The electric force of repulsion separates the spheres and an equilibrium is reached when the suspending filaments make an angle of 10°. Assuming $e_r = 1$, g = 9.8N/kg and negligible mass for the filaments, find Q.	4	L3	CO1
		OR			
Q.2	a.	Define Point charge and using Coulomb's Law, derive expression for electric field intensity due to a point charge.	8	L2	CO1
	b.	Let a point Q1 = 25nc be located at A(4, -2, 7) and a charge Q2 = 60nc be at B(-3, 4, -2). Find $\bar{E}$ at C(1, 2, 3). Also find direction of the electric field. Given $\varepsilon_0 = 8.854 \times 10^{-12}$ F/m.	8	L3	CO1
	c.	Two point charges of $+3 \times 10^{-9}$ C and -2×10^{-9} C are spaced two meter apart. Determine the electric field at a point which is one meter from each of the two point charges.	4	L3	CO1
		Module – 2			
Q.3	a.	State and prove Gauss Divergence theorem or divergence theorem.	8	L2	CO2
	b.	A point charge , Q = 30nc is located at the origin in Cartesian coordinates. Find the electric flux density and electric field intensity at (1, 3, -4)m.	8	L3	CO2
	c.	Derive an equation for equation of continuity (continuity of current).	4	L3	CO2
		OR			
Q.4	a.	State and prove Gauss law.	8	L2	CO2
	b.	Given that the potential field is $V = 2x^2y - 5z$. Find the potential , electric field intensity and volume charge density at point P(-4, 3, 6).	8	L3	CO2
	c.	State Gauss law in point form. Hence derive Maxwell's first equation.	4	L3	CO2

		Module – 3			
Q.5	**a.**	Starting from gauss law, derive Poisson's and Laplace equation. Hence define Laplace equation in all three coordinate systems.	4	L2	CO3
	b.	State and prove Stoke's theorem.	8	L2	CO3
	c.	Find the potential and volume charge density at P(0.5 , 1.5 , 1)m in free space. Given the potential field as under. i) $V = 2x^2 - y^2 - z^2$ volt ii) $V = 6\,r\,\phi\,z$ volt.	8	L3	CO3
		OR			
Q.6	**a.**	State and prove Biot – Savart's law.	4	L1	CO3
	b.	State and prove Ampere's circuital law.	8	L1	CO3
	c.	The magnetic field intensity is given in a certain region of space as : $\vec{H} = \left(\frac{x+2y}{z^2}\right)\hat{a}_y + \frac{2}{z}\hat{a}_z$ A/m. i) Find $\nabla \times \vec{H}$ ii) Find $\vec{J}$ iii) Use $\vec{J}$ to find total current passing through the surface , $Z = 4$, $1 < x < 2$, $3 < y < 5$ in the $\hat{a}_z$ direction.	8	L3	CO3
		Module – 4			
Q.7	**a.**	Define current element. Derive an equation for force on a differential current element in a magnetic field.	8	L2	CO4
	b.	A point charge Q = 18nc has a velocity of 5×10^6 m/s in the direction $\bar{a} = 0.6\,\hat{a}_x + 0.75\,\hat{a}_y + 0.3\,\hat{a}_z$. Calculate the magnitude of the force exerted on the charge by the field $\vec{B} = -3\,\hat{a}_x + 4\,\hat{a}_y + 6\,\hat{a}_z$ mT.	8	L3	CO4
	c.	Calculate the force on a straight conductor of length 0.3m carrying a current 5A in the Z – direction where the magnetic field is $\vec{B} = 3.5 \times 10^{-3}\,(a\hat{x} - a\hat{y})$ Tesla. ($a\hat{x}$ and $a\hat{y}$ are unit vectors).	4	L3	CO4
		OR			
Q.8	**a.**	Derive magnetic boundary condition for i) Tangential component of magnetic field. ii) Normal component of magnetic field.	8	L2	CO4
	b.	A conductor 4m long lies along the Y – axis with a current of 10A in the $a\hat{y}$ direction. Find the force on the conductor if the field in the region is $\vec{B} = 0.05\,a\hat{x}$ tesla.	8	L3	CO4
	c.	Find the magnetic field intensity inside a magnetic material for following conditions : M = 100A/m and $\mu = 1.5 \times 10^{-5}$ H/m B = 200μT , X_m (Magnetic susceptibility = 15).	4	L3	CO4

		Module – 5			
Q.9	a.	Derive Integral and point form of Faraday's law.	8	L2	CO5
	b.	Given $\vec{E} = E_m \sin(wt - \beta z)\ \hat{ay}$ in free space. Calculate $\vec{D}$, $\vec{B}$ and $\vec{H}$.	8	L3	CO5
	c.	A copper disc 40cm diameter is rotated at 3000 r.p.m on a horizontal axis perpendicular to and through the centre of disc axis, lying in magnetic meridian. Two brushes make contact with the disc at diametrically opposite points on the edge. If horizontal component of earth's field is 0.02 mT, find the induced e.m.f between brushes.	4	L3	CO5
		OR			
Q.10	a.	State and derive Poynting's theorem for uniform plane waves.	8	L2	CO5
	b.	Derive general wave equation in electric and magnetic fields.	8	L2	CO5
	c.	For silver, the conductivity is $\sigma = 3.0 \times 10^6$ s/m. At what frequency will depth of penetration be 1mm?	4	L3	CO5

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CBCS SCHEME

USN | | | | | | | | | | | BEC402

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Principles of Communication 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 probability. Illustrate the relationship between sample space, events and probability.	06	L1	CO1
	b.	Outline random processes and illustrate an ensemble of sample function with a neat diagram.	06	L2	CO1
	c.	Show that if a Gaussian process x(t) is applied to a stable linear filter, then the random process y(t) developed at the output of the filter is also Gaussian.	08	L3	CO2
		OR			
Q.2	a.	What is conditional probability? Prove that $P(B/A) = P(A/B) \cdot P(B) / P(A)$	06	L1	CO1
	b.	Define mean, correlation and covariance function.	06	L2	CO2
	c.	Develop a program to generate the probability density function of Gaussian distribution function.	08	L3	CO2
		Module – 2			
Q.3	a.	An antenna has an impedance of 40 Ω an unmodulated AM signal produces a current of 4.8 A. The modulation is 90 percent calculate i) The carrier power ii) The total power iii) The sideband power	06	L1	CO1
	b.	Explain with neat diagrams amplitude demodulation using the diode detector.	07	L1	CO1
	c.	Explain a general block diagram of an FDM system	07	L2	CO2
		OR			
Q.4	a.	Interpret the concept of modulation index and percentage of modulation write the necessary equations.	06	L1	CO1
	b.	Explain high level collector modulation with neat block diagram.	07	L2	CO1
	c.	Explain with diagrams the working principle of lattice type balanced modulator.	07	L2	CO2
		Module – 3			
Q.5	a.	Compare and contrast FM and AM.	06	L1	CO1
	b.	Explain with diagrams the working principle of frequency modulation using voltage controlled oscillator.	07	L2	CO2
	c.	Explain general block diagram of a super heterodyne receiver.	07	L2	CO2
		OR			
Q.6	a.	The input to an FM receiver having an S/N of 2.8. The modulating frequency is 1.5 KHz. The maximum permitted deviation is 4 KHz. What are (i) The frequency deviation caused by the noise (ii) The improved output S/N.	06	L2	CO2
	b.	Define PLL. Explain the basic block diagram of a PLL.	07	L1	CO2
	c.	Explain JFET mixer.	07	L2	CO2

		Module – 4			
Q.7	**a.**	What are the advantages of digital signal over analog signals?	**04**	**L1**	**CO1**
	b.	Explain with basic elements of a PCM system with neat diagrams.	**08**	**L2**	**CO1**
	c.	For the data stream 0 1 1 0 1 0 0 1 draw the following line code waveforms i) Unipolar NRZ ii) Polar NRZ iii) Unipolar RZ iv) Manchestor code	**08**	**L3**	**CO2**
		OR			
Q.8	**a.**	State and prove Sampling theorem.	**04**	**L1**	**CO1**
	b.	What is multiplexing and why is it required in communication? Explain the working of TDM with a neat block diagram.	**08**	**L2**	**CO1**
	c.	Explain the generation of PPM with a relevant block diagrams and waveforms.	**08**	**L2**	**CO2**
		Module – 5			
Q.9	**a.**	Define Intersymbol interference (ISI) outline baseband binary data transmission system with neat block diagram and equations.	**08**	**L2**	**CO1**
	b.	Develop a code to generate RZ pulse.	**04**	**L3**	**CO2**
	c.	Define signal to noise ratio. Explain different types of external and internal noise.	**08**	**L2**	**CO1**
		OR			
Q.10	**a.**	Explain the following concept briefly: i) Nyquist criterion for distributors transmission ii) Baseband M-ary PAM transmission	**08**	**L1**	**CO2**
	b.	Develop a code to generate Raised cosine pulse.	**04**	**L2**	**CO2**
	c.	Illustrate the concept of noise in cascaded stages with a diagram. Write Friis formula and mention its terms.	**08**	**L2**	**CO3**

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CBCS SCHEME

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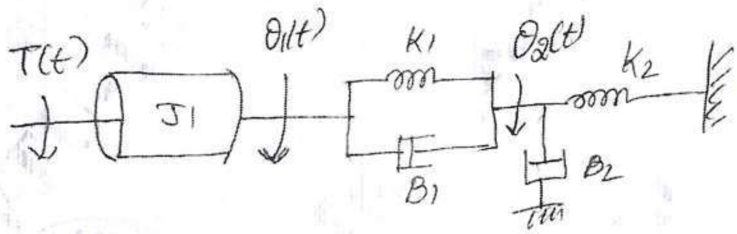
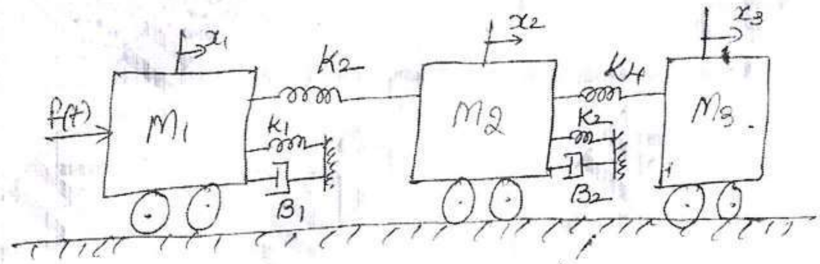
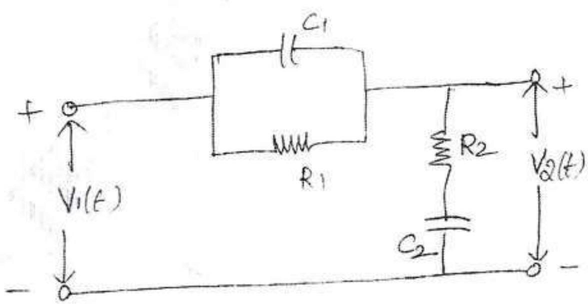
BEC403

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Control 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.	Compare open loop and closed loop control system with practical example.	06	L2	CO1
	b.	For the system shown in Fig.Q1(b). Find the transfer function $G(s) = \frac{\theta_2(s)}{T(s)}$ consider $J_1 = 1\ kgm^2$, $K_1 = 1$ Nm/rad, $K_2 = 1$ Nm/rad, $B_1 = 1$ Nm/rad/sec, $B_2 = 1$ Nm/rad/sec.  Fig.Q1(b)	06	L2	CO1
	c.	Draw the mechanical network for the system shown in Fig.Q1(c). Write the equations of performance and draw its analogous circuit based one force voltage analogy.  Fig.Q1(c)	08	L2	CO1
		OR			
Q.2	a.	The circuit shown in Fig.Q2(a) is called lead-lag filter. Find the transfer function $\frac{V_2(s)}{V_1(s)}$ when $R_1 = 100\ \Omega$, $R_2 = 200\ K\Omega$, $C_1 = 1\ \mu F$ and $C_2 = 0.1\ \mu F$.  Fig.Q2(a)	10	L3	CO1

b. What are the variables and elements of translational motion? For the mechanical system shown in Fig.Q2(b). — **10** | **L2** | **CO2**

(i) Write the differential equations of performance.

(ii) Draw and write loop and nodal equations based on F-V and F-I analogous networks.

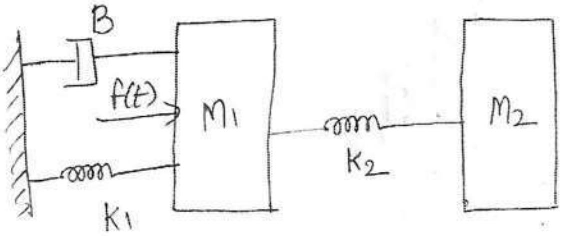


Fig.Q2(b)

Module – 2

Q.3 a. Give any six block diagram reduction rules to find the transfer function of the system. — **04** | **L1** | **CO2**

b. For the system represented in the given Fig.Q3(b), determine transfer function C(s)/R(s). — **06** | **L2** | **CO1**

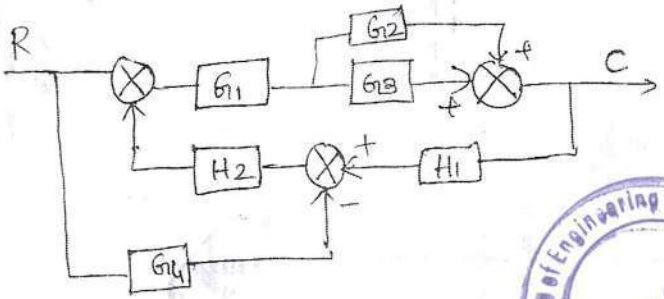


Fig.Q3(b)

c. Find the overall transfer function of the system whose signal flow graph is shown in Fig.Q3(c). — **10** | **L2** | **CO2**

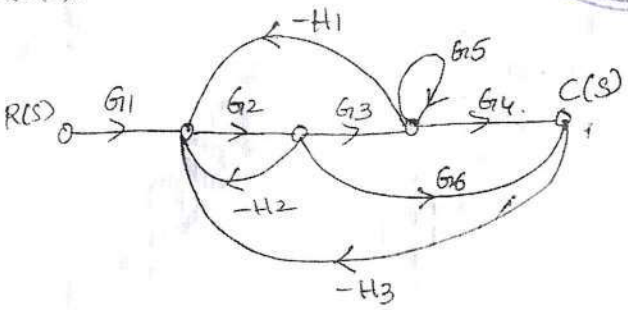


Fig.Q3(c)

OR

Q.4 a. Interpret the transfer function by converting the block diagram into signal flow graph. — **10** | **L2** | **CO2**

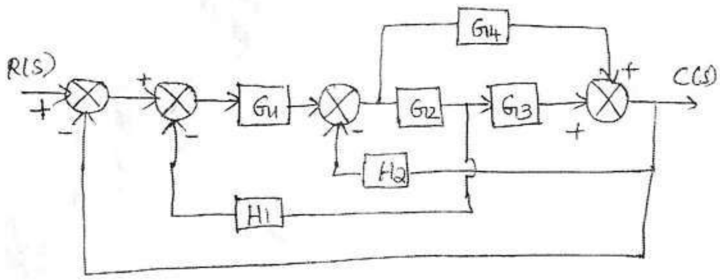
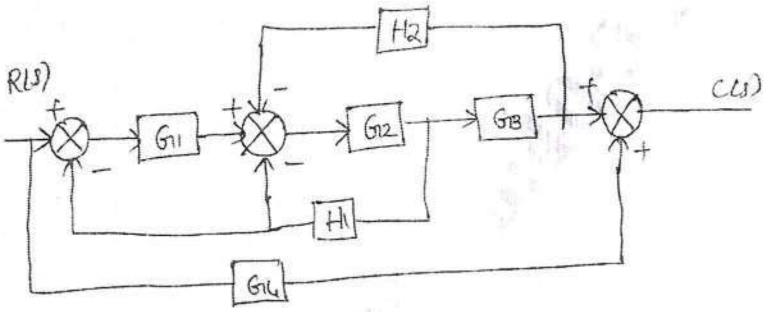
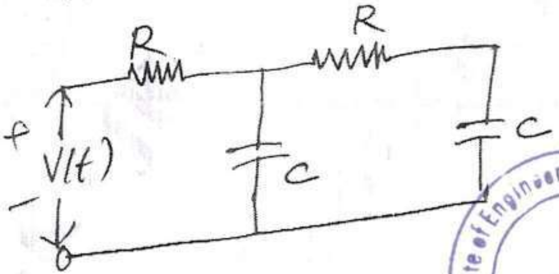


Fig.Q4(a)

	b.	Obtain the transfer function for the block diagram shown in Fig.Q4(b) using block diagram reduction technique.  Fig.Q4(b)	10	L2	CO2
		Module – 3			
Q.5	a.	Make use of the response curve of 2nd order under-damped system to define and derive the expression for (i) peak time (ii) peak overshoot (iii) rise time	10	L2	CO3
	b.	Find K_p, K_v and K_a for a system having $G(s) = \frac{s+10}{s(s^3+7s^2+12s)}$. Also, evaluate the steady state error, when the I/P r(t) is given by: (i) r(t) = 5u(t) (ii) r(t) = 2t u(t) (iii) $r(t) = 4t^2 u(t)$	10	L2	CO3
		OR			
Q.6	a.	Derive an expression for the under damped response of a second order feedback control system for step input.	10	L2	CO2
	b.	Explain the static error constant and derive the expressions.	06	L2	CO2
	c.	Analyze the effect of PD controller for 2nd order control system with appropriate equations.	04	L2	CO2
		Module – 4			
Q.7	a.	The open loop transfer function of a unity feedback system is given by $G(s) = \frac{K}{s(s+3)(s^2+s+1)}$. Find the valve of K that will cause sustained oscillation and hence find the oscillation frequency.	08	L2	CO3
	b.	Sketch the root locus plot for a negative feedback control system whose open loop transfer function is given by $G(s)H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$. For all values of K ranging from 0 to α. Find the value of K for closed loop stability.	12	L3	CO3
		OR			
Q.8	a.	For the characteristic equations given below, determine number of roots with positive real part: i) $s^6+s^5+3s^4+2s^3+5s^2+3s+1=0$ ii) $s^8+s^7+4s^6+3s^5+14s^4+11s^3+20s^2+9s+9=0$	10	L2	CO4

	b.	Show that the part of root locus of a system with $G(s)H(s) = \frac{K(s+3)}{s(s+2)}$ is a circle having center (–3, 0) and radius at $\sqrt{3}$.	10	L3	CO3
		Module – 5			
Q.9	a.	Construct the bode plot for the transfer function $G(s) = \frac{80}{s(s+2)(s+20)}$. Determine GM and PM, ω_{pc}, ω_{gc}.	10	L2	CO3
	b.	Obtain the state transmition matrix for the following system: $\begin{bmatrix} x_1^1 \\ x_2^1 \end{bmatrix} = \begin{bmatrix} -1 & -0.5 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0.5 \\ 0 \end{bmatrix} u$	10	L2	CO5
		OR			
Q.10	a.	Using Nyquist stability criteria investigate the stability negative feedback control system whose open loop transfer function is given by $G(s)H(s) = \frac{100}{(s+1)(s+2)(s+3)}$. Assume ω_g = 1.253 rad/sec.	10	L2	CO5
	b.	Obtain the state model of electrical network shown in Fig.Q10(b), by choosing $V_1(t)$ and $V_2(t)$ as state variables.  Fig.Q10(b)	10	L3	CO5

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BEC501

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Technological Innovation and Management Entrepreneurship

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 roles played by Managers.	10	L1	CO1
	b.	Describe the managerial skills required using skill-mix diagram.	10	L1	CO1
		OR			
Q.2	a.	Explain the various steps involved in planning.	10	L2	CO1
	b.	Explain all the steps in rational decision making with a neat diagram.	10	L2	CO1
		Module – 2			
Q.3	a.	Define organization. Briefly explain the principles of organizing.	10	L2	CO2
	b.	What is recruitment? Explain the steps in the selection process.	10	L2	CO2
		OR			
Q.4	a.	Explain Maslow's need hierarchy theory with a neat diagram along with examples.	10	L2	CO2
	b.	Discuss Autocratic, Democratic and Free-rein leadership styles.	10	L2	CO2
		Module – 3			
Q.5	a.	Define Social Audit. Explain the benefits and limitations of social audit.	10	L2	CO3
	b.	Explain the different views on social responsibility of business.	10	L2	CO3
		OR			
Q.6	a.	Explain different types of entrepreneurs by defining an entrepreneur.	10	L2	CO3
	b.	Explain entrepreneurial development cycle.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain the different Government policy and development of the small scale sector in India.	10	L2	CO4
	b.	Explain the problems for small scale industries.	10	L2	CO4
		OR			
Q.8	a.	Explain the identification of business opportunities in India.	10	L2	CO4
	b.	Explain in detail the project feasibilities.	10	L2	CO4
		Module – 5			
Q.9	a.	What are the reasons for failure of some business plans?	10	L2	CO4
	b.	Explain the Government schemes for funding business.	10	L2	CO4
		OR			
Q.10	a.	Explain the challenges and difficulties in starting an enterprise.	10	L2	CO4
	b.	Describe the limitations and differences of PERT and CPM.	10	L2	CO4

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BEC502

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

Digital Signal Processing

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.	List and discuss different discrete time signals.	7	L2	CO1
	b.	Explain the steps of converting along to digital signal interms of frequencies.	7	L2	CO1
	c.	Discuss the advantages and limitations of Digital Signal Processing (DSP).	6	L2	CO1
		OR			
2	a.	With an example, explain how to verify any signal is periodic or Not.	6	L2	CO1
	b.	Derive the equation for output of a LTI system and list the steps of convolution.	8	L3	CO2
	c.	Write a program to generate : i) Circuit step sequence ii) Sinusoidal sequence.	6	L3	CO2
		Module – 2			
3	a.	Describe the properties of Z – transformation.	7	L3	CO2
	b.	Show that Discrete Fourier Transform (DFT) is a Liner Transformation.	7	L3	CO2
	c.	Compute the A-point DFT of x(n) = {1, 1, 0, 0}.	6	L3	CO2
		OR			
4	a.	Compute the N-point DFT of, $x(n) = e^{j\omega mn}$.	6	L3	CO2
	b.	State and prove symmetry property of DFT for real valued sequence.	6	L3	CO2
	c.	Compute circular convolution of sequences : $x_1(n) = \{2, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$.	8	L3	CO2
		Module – 3			
5	a.	State and prove circular item shift property of DFT.	6	L3	CO2
	b.	Compare DFT and FFT with examples.	6	L2	CO3
	c.	Compute Radix – 2 DIT FFT of the following – sequence, x(n) = n + 1, for $0 \le n \le 7$.	8	L3	CO3
		OR			
6	a.	State and prove Parseval's theorem for – DFT's.	6	L3	CO2
	b.	Explain overlap – save method used for the convolution of long input sequences.	6	L2	CO3
	c.	Develop an algorithm for Radix – 2 FFT without using built in function.	8	L3	CO3

		Module – 4			
7	a.	Obtain the frequency response expression for the symmetric linear phase FIR filter.	**8**	**L3**	**CO4**
	b.	Compare different widows used to design FIR filters.	**6**	**L2**	**CO4**
	c.	Design an FIR filter using hamming window for N = 7. The desired frequency response is given by $H_d(\omega) = \begin{cases} e^{-j3\omega} & \lvert\omega\rvert \le \frac{3\pi}{4} \\ 0, & \frac{3\pi}{4} < \lvert\omega\rvert\pi \end{cases}$.	**6**	**L3**	**CO4**
		OR			
8	a.	Discuss the characteristics of practical frequency selective filters.	**6**	**L3**	**CO**
	b.	Explain the steps of designing linear phase FIR high pass filter.	**8**	**L2**	**CO4**
	c.	Realize the system function of following FIR filter in cascade form. $H(z) = 1 - 2z^{-1} + \frac{1}{2}z^{-2} + \frac{1}{2}z^{-3} - \frac{1}{2}z^{-4}$.	**6**	**L3**	**CO4**
		Module – 5			
9	a.	Explain the design procedure of analog Butter worth lowpass prototype – filter?	**8**	**L3**	**CO5**
	b.	Construct the system function in S – domain for N = A.	**6**	**L3**	**CO5**
	c.	Realize direct form – II for the IIR filter represented by $y(n) - \frac{1}{4}y(n-1) + \frac{1}{8}y(x-2) = x(n) + \frac{1}{2}x(n-2)$.	**6**	**L3**	**CO5**
		OR			
10	a.	Design the digital IIR filter for following details. –3dB gain at 0.5π rads and the stop band automation of 15dB at 0.75π rads. Assume $T_s = 15$.	**8**	**L3**	**CO5**
	b.	Explain the significance of : i) Prewarping ii) Bilinear transformation.	**6**	**L2**	**CO5**
	c.	Obtain the direct form-I realization of following IIR filter : $H(z) = \frac{1 + 0.4z^{-1}}{1 - 0.5z^{-1} + 0.06z^{-2}}$.	**6**	**L3**	**CO5**

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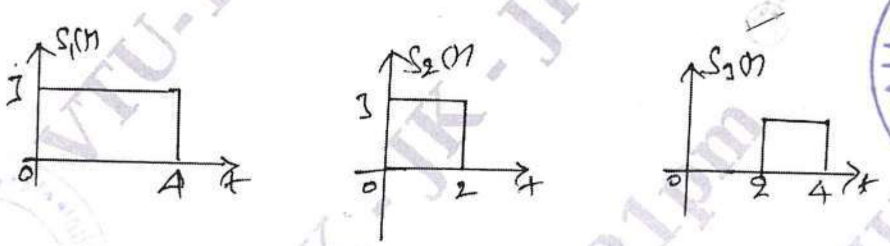
BEC503

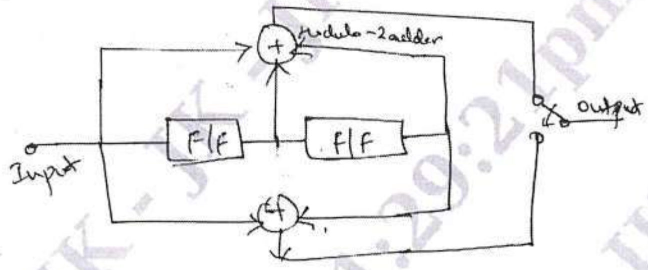
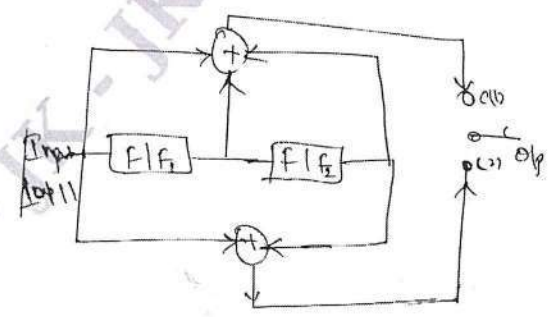
Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025

Digital Communication

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 Hilbert transform and its properties.	6	L2	CO1
	b.	Describe the canonical representation of bandpass signal.	7	L2	CO1
	c.	Describe the correlation receiver with neat diagram.	7	L2	CO1
		OR			
Q.2	a.	Apply gram Schmidt orthogonalizaiton procedure find the set of orthonormal basis function to represent the signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ as shown in Fig.Q2(a). Also express each of these figures interms of set of basis function.  Fig.Q2(a)	10	L3	CO1
	b.	Derive the equation for converting continuous AWGN channel into a vector channel.	10	L2	CO1
		Module – 2			
Q.3	a.	Describe with a neat diagram, the generation and detection of BPSK signal.	8	L2	CO2
	b.	Define bandwidth efficiency. Tabulate the comment on the bandwidth efficiency of M-ary PSK signal.	8	L2	CO2
	c.	Encode the binary sequence using DPSK 11011011. Assume reference bit as 1.	4	L2	CO2
		OR			
Q.4	a.	Derive the expression for probability of error of QPSK signal.	8	L2	CO2
	b.	Discuss the non-coherent detection of BFSK signal.	8	L2	CO2
	c.	Calculate the average power required for a DPSK signal operation gat a data rate of 1000 bit/sec, over a band-pass channel having a bandwidth of 3000 Hz, $\frac{N_0}{2} = 10^{-10}\, w/H_z$ probability of error $P_e = 10^{-5}$.	4	L3	CO2
		Module – 3			
Q.5	a.	Define entropy and summaries its properties.	6	L2	CO3
	b.	A source has five symbols S = {S_1. S_2, S_3, S_4, S_5} with probabilities P = {0.4, 0.2, 0.2, 0.1, 0.1} respectively. compute the source code using Huffman binary coding. Also find the average length and entropy.	8	L3	CO3
	c.	Briefly discuss instantaneous code with an example.	6	L2	CO3
		OR			
Q.6	a.	Derive the expression for mutual information and summarize its properties.	10	L2	CO3
	b.	Derive the expression for the channel capacity of binary symmetric channel.	10	L3	CO3

		Module – 4			
Q.7	**a.**	Indicate the advantages and disadvantages of error control coding. Also differentiate between block code and convolution code.	**8**	**L2**	**CO4**
	b.	If 'C' is a valid code vector then show that $CH^T = 0$ where H is parity check matrix of code.	**5**	**L2**	**CO4**
	c.	Design an encoder for the (7, 4) binary cyclic code generated by : $g(x) = 1 + x + x^3$ for the message vector [1001].	**7**	**L3**	**CO4**
		OR			
Q.8	**a.**	Describe the block diagram of generator and parity check matrix with equation. Also write the syndrome equation and list its properties.	**10**	**L2**	**CO4**
	b.	A (7, 4) Linear block code has : $P = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$ i) All possible code vector ii) Determine the Hamming weight of each code word iii) If the received vector is [1100010]. Determine its syndrome correct the codeword.	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	For a given convolutional encoder shown in Fig.Q9(a), with D = 10011. Compute output sequence using transform domain approach. Also draw the code free diagram.  Fig.Q9(a)	**10**	**L3**	**CO5**
	b.	Describe the recursive systematic convolutional code encoder with an example.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	A convolution encoder has two flip-flop with two states, three modulo – 2 adders and an output multiplexer. The generator sequences of the encoder. $g^{(1)} = (1, 0, 1)$, $g^{(2)} = (1, 1, 0)$, $g^{(3)} = (1, 1, 1)$. i) Generator matrix [G] ii) Draw the encoder block diagram iii) Calculate the codeword for the message input vector 11101.	**10**	**L3**	**CO5**
	b.	For a given convolution encoder shown in Fig.Q10(b). Build state table, state transaction table, sketch diagram and describe the Trellis diagram for the input message vector (10111).  Fig.Q10(b)	**10**	**L3**	**CO5**

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BEC515A

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Intelligent Systems and Machine Learning 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 history of AI.	10	L2	CO1
	b.	Define AI. Explain the foundation of AI in detail.	10	L2	CO1
		OR			
Q.2	a.	Explain properties of task environment.	10	L2	CO1
	b.	Differentiate between simplex reflex agents and model based reflex agents.	10	L2	CO1
		Module – 2			
Q.3	a.	List and explain the components required to define a problem.	10	L2	CO2
	b.	Explain goal formulation and problem formulation with examples.	10	L2	CO2
		OR			
Q.4	a.	Explain Breadth First Search and Depth First Search algorithms with an example.	10	L3	CO2
	b.	Illustrate different methods of evaluating an algorithm's performance.	10	L2	CO2
		Module – 3			
Q.5	a.	Describe greedy best first search as an informed search strategy.	10	L2	CO2
	b.	Explain knowledge based agent with a generic knowledge based agent program.	10	L2	CO3
		OR			
Q.6	a.	Describe syntax and semantics with respect to propositional logic.	10	L2	CO3
	b.	Explain Wumpus World with respect to artificial intelligence.	10	L2	CO3
		Module – 4			
Q.7	a.	What is Machine Learning? Explain with specific examples.	06	L2	CO4
	b.	Explain perspectives and issues in Machine Learning.	04	L2	CO4
	c.	Explain types of Machine Learning System.	10	L2	CO4
		OR			
Q.8	a.	Describe the main challenges of Machine Learning.	10	L2	CO4
	b.	Explain: (i) Find S algorithm (ii) Candidate elimination algorithm	10	L2	CO4
		Module – 5			
Q.9	a.	Explain working with Real data and Get the data.	10	L2	CO5
	b.	Write a note on Launch, Monitor and Maintain your system.	10	L2	CO5
		OR			
Q.10	a.	Describe the steps involved in preparing the data for machine learning model.	10	L2	CO5
	b.	Explain MNIST with respect to Machine Learning.	10	L2	CO5

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CBCS SCHEME

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BEC/BTE/BVL601

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025
Embedded System Design

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 Embedded System? List the applications of Embedded System.	06	L2	CO1
	b.	Give the difference between microcontroller and Microprocessor	06	L2	CO1
	c.	Explain about opto coupler and Push button switch with neat diagram	08	L2	CO1
		OR			
Q.2	a.	Give the classification of Embedded System with examples.	06	L2	CO1
	b.	Give the difference between Von-Neumann and Harvard Architecture.	06	L2	CO1
	c.	Explain Piezo buzzer, sensor and actuators in embedded system with neat diagram.	08	L2	CO1
		Module – 2			
Q.3	a.	Explain the characterstics and quality attributes of Embedded System.	06	L2	CO2
	b.	Explain the working of washing machine with a neat functional diagram	06	L2	CO2
	c.	Design and automatic tea/coffee vending machine based on FSM model.	08	L3	CO2
		OR			
Q.4	a.	Explain operational and non operational attributes of embedded systems.	06	L2	CO2
	b.	Explain the hardware and software co-design in embedded system.	06	L2	CO3
	c.	With the help of FSM model, explain the system design and operation of automatic seat belt warning.	08	L2	CO3
		Module – 3			
Q.5	a.	Explain monolithic and microkernel with suitable example for each.	06	L2	CO3
	b.	Explain different conditions that favour deadlock.	06	L2	CO3
	c.	Describe pre-entire SIF scheduling and calculate all the performance factors.	08	L2	CO3
		OR			
Q.6	a.	Explain task, process and threads in ARM processor.	06	L2	CO3
	b.	With a diagram explain the concept of counting semaphore with an example.	06	L2	CO3
	c.	Explain the IDE environment for embedded system design with a neat block diagram	08	L2	CO3
		Module – 4			
Q.7	a.	Explain the functions of various units in ARM cortex M_3 processor architecture in brief.	08	L2	CO4
	b.	Explain the various interrupts and exception along with the vector address	06	L2	CO4
	c.	Explain the ARM core data flow model with a neat diagram.	06	L2	CO4
		OR			
Q.8	a.	Explain program status register in cortex M_3 alog with vector address	08	L2	CO4
	b.	Explain any five applications of ARM cortex M_3 based on its features	06	L2	CO4
	c.	With adiagram, explain two operation modes and privilege levels in cortex M_3	06	L2	CO4

Module – 5					
Q.9	**a.**	Write an ALP to add the first 10 integer number using cortex M_3 processor	**06**	**L2**	**CO5**
	b.	Explain shift and rotate instruction of CORTEX M_3 with examples	**06**	**L2**	**CO5**
	c.	Describe CMSIS with diagram and its functions.	**08**	**L2**	**CO5**
OR					
Q.10	**a.**	Explain 16 – bit instructions with example. a) ADD b)CMP c)ASR	**06**	**L2**	**CO5**
	b.	Write an assembly language to determine the parity of 32 bit number.	**06**	**L2**	**CO5**
	c.	Explain 32 bit instruction with example a) ADC b)BFC c)LSL d) PUSH	**08**	**L2**	**CO5**

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CBCS SCHEME

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

BEC/BTE/BVL613C

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2025
Digital Image Processing

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 fundamental steps in Digital Image Processing.	10	L2	CO1
	b.	Consider the 2 image subsets, S_1 and S_2 shown below. For V = {1}, determine whether these subsets are 4 – adjacent, 8 - adjacent and m-adjacent.	10	L3	CO1

S1 S2

0	0	0	0	0	0	0	1	1	0
1	0	0	1	0	0	1	0	0	1
1	0	0	1	0	1	1	0	0	0
0	0	1	1	1	0	0	0	0	0
0	0	1	1	1	0	0	1	1	1

OR

			M	L	C
Q.2	a.	Explain the components of a general purpose image processing system.	10	L2	CO1
	b.	Consider the image segment shown below. Let V = {2, 3, 4}. Find the lengths of the shortest 4-, 8-, and m – paths between p and q.	10	L3	CO1

3 4 1 2 0
0 1 0 4 2 (q)
2 2 3 1 4
(p) 3 0 4 2 1
1 2 0 3 4

		Module – 2	M	L	C
Q.3	a.	Justify that DCT is a fast transform.	10	L3	CO1
	b.	Find the 2D – DFT of the following image.	10	L3	CO2

$$\text{Matrix } U = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

OR

			M	L	C
Q.4	a.	Justify that Haar Transform can be implemented in O(N) operations.	10	L3	CO2
	b.	Find the - DCT of x(n) = { 1, 2, 1,4}	10	L3	CO2

		Module – 3	M	L	C
Q.5	a.	Describe image negative and logarithmic transformations.	10	L1	CO3

	b.	Assuming continuous intensity values, an image has the intensity pdf, $P_r^{(r)} = \begin{cases} \dfrac{2r}{(L-1)^2}, & o \le r \le L-1 \\ 0 & \text{else where} \end{cases}$ Find the transformation function that would produce an image whose intensity pdf is, $P_z(z) = \begin{cases} \dfrac{3z^2}{(L-1)^3}, & o \le z \le L-1 \\ 0 & \text{else where} \end{cases}$	10	L3	CO3
		OR			
Q.6	a.	Explain piecewise – linear transformation functions used in image enhancement.	10	L2	CO3
	b.	Find histogram linearization of the following image segment. $\begin{bmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{bmatrix}$	10	L3	CO3
		Module – 4			
Q.7	a.	Describe image smoothing filters in frequency – domain.	10	L1	CO4
	b.	Explain pseudo colour Image Processing.	10	L2	CO4
		OR			
Q.8	a.	Explain Image sharpening filters in frequency – domain.	10	L2	CO4
	b.	Describe homomorphic filtering in detail.	10	L1	CO4
		Module – 5			
Q.9	a.	Describe a model for image degradation /restoration process.	10	L1	CO5
	b.	Explain some important noise pdfs.	10	L2	CO5
		OR			
Q.10	a.	Explain 4 order – statistics filters used in image restoration.	10	L2	CO5
	b.	Describe 4 mean filters used in image restoration.	10	L1	CO5

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CBCS SCHEME

USN | | | | | | | | | | | **BEC302**

Third Semester B.E./B.Tech. Degree Examination, June/July 2025
Digital System Design using Verilog

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.	Design a combinational logic circuit which takes two, 2-bit binary numbers as its input and generates an output equal to 1, when the sum of the two numbers is even.	6	L1	CO1
	b.	Develop the canonical forms for the following Boolean equations: i) a + b (a + c) + bc ii) (a + b) (c + d)	6	L1	CO1
	c.	Find all the prime implicants and essential prime implicants for the following functions using k-map method: i) $P = f(a, b, c, d) = \Sigma(1, 2, 3, 5, 6, 7, 11, 12, 13, 14, 15)$ ii) $S = f(a, b, c, d) = \prod(0, 2, 3, 8, 9, 10, 12, 14)$	8	L2	CO1
		OR			
Q.2	a.	Simplify the following Boolean functions using k-map. Draw the logic diagram for the simplified equation: i) $w = f(a,b,c,d) = \Sigma(1,5,7,9,13,15) + \Sigma d(8,10,11,14)$ ii) $y = f(a,b,c,d) = \pi(0,2,3,4,5,12,13) + \pi d(8,10)$	10	L2	CO1
	b.	Solve the following Boolean function by using Quine-McClusky method. Verify using k-map $s = f(w,x,y,z) = \Sigma(2,3,4,5,13,15) + \Sigma d(8,9,10,11)$	10	L2	CO1
		Module – 2			
Q.3	a.	Realize the following functions using 3:8 decoder along with OR and/or NOR gates. In each case the gates should be selected so as to minimize their total number of inputs. i) $f_1(a,b,c) = \sum m(1,3,6)$ and $f_2(a,b,c) = \sum m(2,5,7)$ ii) $f_1(a,b,c) = \Pi M(0,3,5,6,7)$ and $f_2(a,b,c) = \Pi M(2,3,4,5,7)$	7	L2	CO2
	b.	Design a priority encoder for a system with three inputs, the middle bit with highest priority encoded as 10, MSB with next priority encoded as 11 and LSB with least priority encoded as 01. Write functional table and its logic diagram.	5	L2	CO2
	c.	Explain carry look ahead adder with sigma block and necessary equations.	8	L2	CO2

		OR			
Q.4	**a.**	Implement the function $S = f(a,b,c,d) = \Sigma(1,3,4,11,12,13,14,15)$ using i) 8:1 MUX and ii) 16:1 MUX	7	L2	CO2
	b.	Design a single decade decimal adder with necessary correction circuit.	8	L2	CO2
	c.	Explain briefly Programmable Array Logic (PAL).	5	L2	CO2
		Module – 3			
Q.5	**a.**	Construct the logic diagram of master slave JK flipflop and its truth table. Explain with necessary timing diagram.	8	L2	CO3
	b.	Construct Johnson counter using positive edge triggered flipflops and explain with necessary truth table.	8	L2	CO3
	c.	Derive the characteristic equation of SR flipflop.	4	L2	CO3
		OR			
Q.6	**a.**	Explain universal shift register with the help of logic diagram and mode control table.	10	L2	CO3
	b.	Design a mod-6 synchronous counter with the sequence 0 – 2 – 5 – 6 – 4 – 3 using T flipflops.	10	L2	CO3
		Module – 4			
Q.7	**a.**	Explain the following data types in verilog with example: i) Nets ii) Registers iii) Integer iv) Parameter	8	L2	CO4
	b.	Evaluate the following if A = 0011, B = 0100, E = 4 and F = 2 i) A * B ii) A + B iii) E * * F iv) A & B v) A < < 2 vi) {A[3], B}	6	L2	CO4
	c.	Write a verilog data flow model for full subtractor.	6	L2	CO4
		OR			
Q.8	**a.**	Explain three styles of description available in verilog with half adder example.	9	L2	CO4
	b.	Realize 2 × 1 multiplexer with active low enable and also write the Verilog program by considering delay time to signal assignment statements. Also draw simulation waveform.	7	L2	CO4
	c.	Write a short note on signal assignment in verilog with an example.	4	L2	CO4
		Module – 5			
Q.9	**a.**	Explain the following sequential statements in verilog : i) For loop ii) While loop iii) Repeat iv) Forever.	8	L1	CO4
	b.	Write a verilog behavioral description for JK flipflop along with the design and timing diagram.	8	L2	CO4

	c.	Explain different case statements in verilog.	4	L2	CO4
		OR			
Q.10	a.	Write a verilog program for 3-bit ripple carry adder using structural description.	8	L2	CO4
	b.	Realize the binary up-down counter using verilog behavioral description.	7	L3	CO4
	c.	Explain if-else-if statement in verilog with an example.	5	L2	CO4

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CBCS SCHEME

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

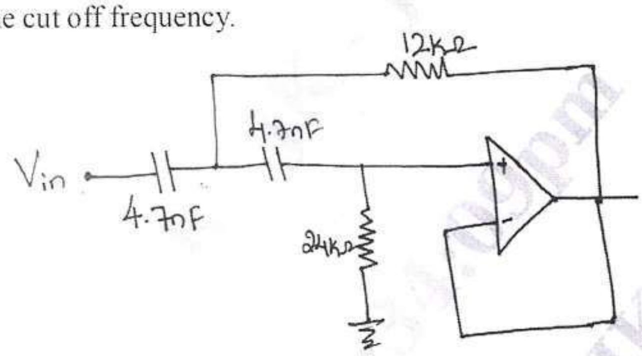
BEC303

Third Semester B.E./B.Tech. Degree Examination, June/July 2025
Electronic Principles and Circuits

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) Voltage – divider bias ii) CC Amplifier iii) TSEB	6	L1	CO1
	b.	Discuss the importance of Emitter Resistance (R_E) with respect to voltage divider bias circuit on Q-point calculate with its supportive graph.	8	L2	CO1
	c.	Compare and summarize with respect to bias circuits; Emitter bias vs voltage divider bias vs two supply emitter bias.	6	L2	CO1
		OR			
Q.2	a.	With suitable circuit and waveforms, Discuss TSEB amplifier.	8	L2	CO1
	b.	Derive the voltage gain equation for the CE amplifier from T model and π model.	6	L2	CO1
	c.	Explain the concept of emitter follower amplifier with suitable waveforms and circuit.	6	L2	CO1
		Module – 2			
Q.3	a.	With neat circuits, deduce the common source amplifier using MOSFET (without R_s) obtain overall gain (G_v).	10	L2	CO2
	b.	Explain the biasing of a MOSFT using fixed V_g and a resistance in source, obtain the current I_d expression with neat circuit diagram.	10	L2	CO2
		OR			
Q.4	a.	Design an MOSFET model of small-signal equivalent circuit by considering various parameter of the model.	10	L2	CO2
	b.	With respect to common-gate amplifier. Derive the equation for overall gain, open circuit voltage gain and voltage gain.	10	L2	CO2
		Module – 3			
Q.5	a.	Discuss the concept of R to 2R ladder type digital to analog converter by considering 4-bit binary input with an Op-Amp circuit also demonstrate the equivalent analog output for the data "1010".	10	L2	CO3
	b.	Explain Colpitt's oscillators with its AC equivalent circuit and design parameter.	10	L2	CO3

		OR			
Q.6	**a.**	Explain the following in view of linear op-amps: i) Schmitt Trigger ii) Single supply comparator	**10**	**L2**	**CO3**
	b.	Design an astable multivibrator using 555 timer with design equations of "T" and frequency.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Summarize various voltage and current amplifier and converter with respect to ideal negative feedback circuits.	**10**	**L2**	**CO4**
	b.	Explain low-pass first order stage with non-inverting unity gain and inverting with voltage gain with suitable op-amp circuit and equations.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Design an second order VCVS unity gain low pass filter for Butterworth responses with an Op-Amp circuit also comment on the frequencies of operation.	**10**	**L2**	**CO4**
	b.	Calculate the value of Q and pole frequency for circuit shown in Fig.Q.8(b) also find the cut off frequency.  Fig.Q.8(b)	**5**	**L2**	**CO4**
	c.	Discuss the concept of MFB bandpass filter with the equation for "f_o".	**5**	**L2**	**CO5**
		Module – 5			
Q.9	**a.**	Briefly describe the concept of DC load line and AC load line with neat circuit	**10**	**L2**	**CO5**
	b.	Explain class B Push-Pull Emitter follower with neat circuit diagram discuss cross-over distortion.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Describe the concept of Gate-Triggering in silicon controlled rectifier.	**8**	**L2**	**CO5**
	b.	Write short notes on following: i) Photo SCR ii) UJT iii) PUT iv) Silicon controlled switch	**12**	**L2**	**CO5**

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CBCS SCHEME

USN | | | | | | | | | | | **BEC304**

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

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.

<table>
<tr><td></td><td></td><td>Module – 1</td><td>M</td><td>L</td><td>C</td></tr>
<tr><td>1</td><td>a.</td><td>Using source transformation and source shifting techniques, find voltage across 2Ω resistor as shown in Fig.Q1(a).

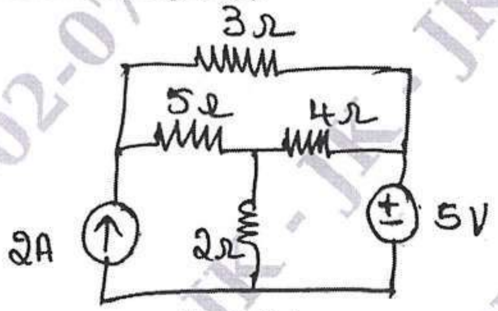



Fig.Q1(a)</td><td>7</td><td>L3</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>For the circuit shown in Fig.Q1(b), determine the equivalent resistance between A and B.

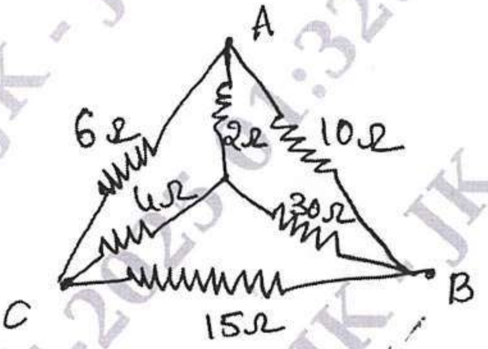



Fig.Q1(b)</td><td>6</td><td>L3</td><td>CO1</td></tr>
<tr><td></td><td>c.</td><td>For the network shown in Fig.Q1(c), compute all node voltages V_1, V_2, V_3 and V_4 using node analysis.

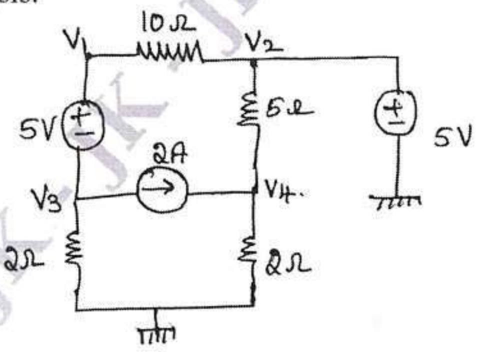
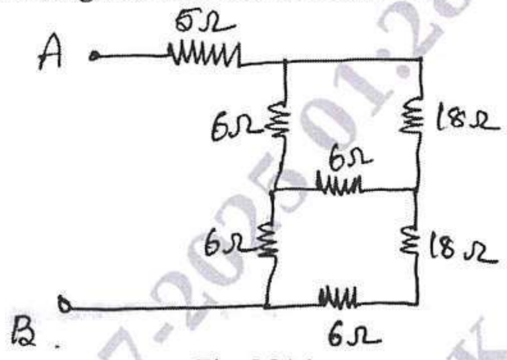
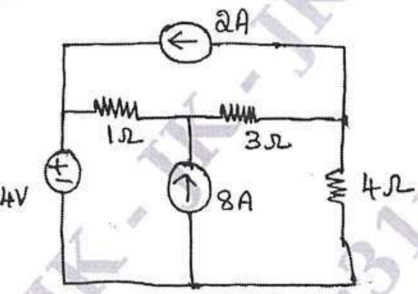
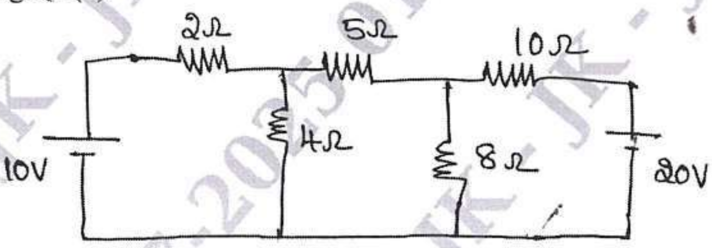
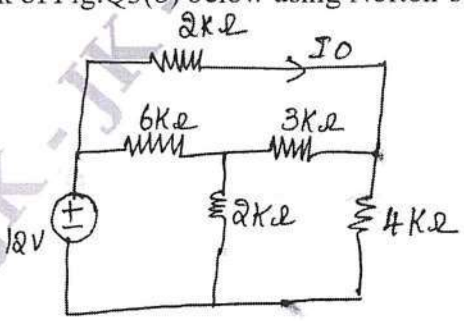



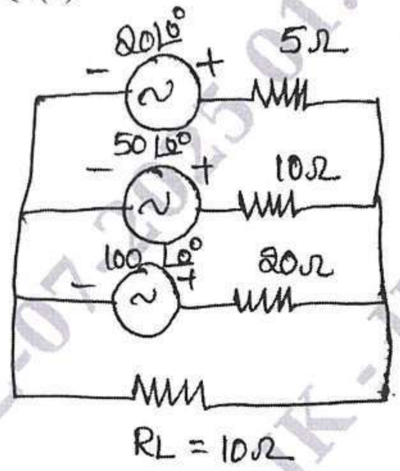
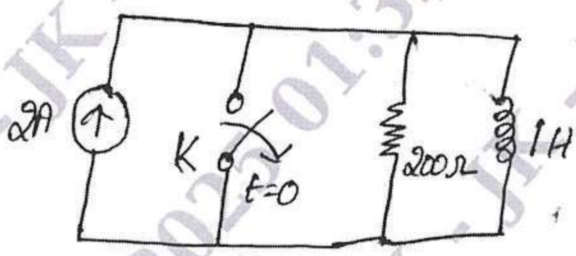
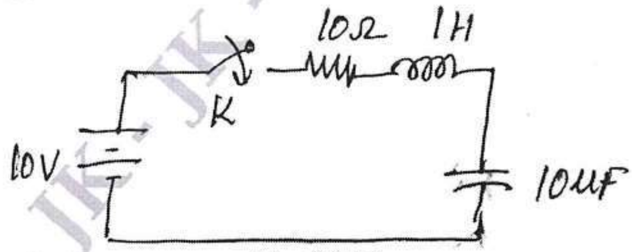
Fig.Q1(c)</td><td>7</td><td>L3</td><td>CO1</td></tr>
</table>

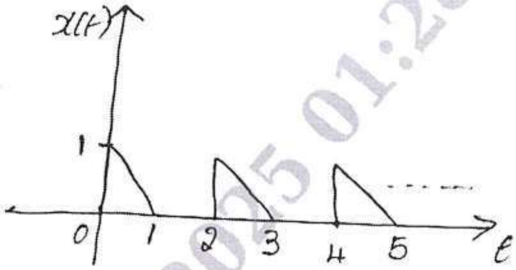
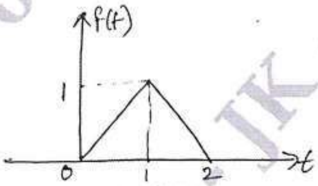
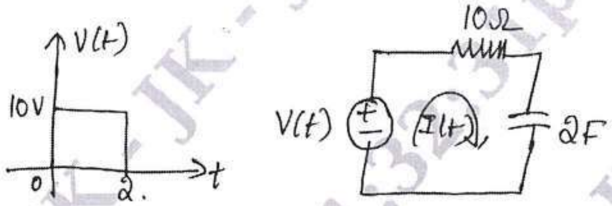
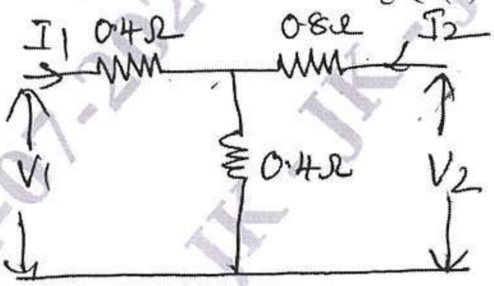
OR

2	a.	Determine the equivalent resistance between terminal A and B, in the network shown in Fig.Q2(a). Using star to Delta transformation.  Fig.Q2(a)	7	L3	CO1
	b.	In the circuit shown in Fig.Q2(b), use the loop analysis to find the power delivered to the 4 Ω resistor.  Fig.Q2(b)	7	L3	CO1
	c.	Using node voltage analysis, find the current in the each branch for the circuit shown in Fig.Q2(c).  Fig.Q2(c)	6	L3	CO1

Module – 2

3	a.	State the explain Theveninls theorem.	8	L2	CO2
	b.	Find I_0 in the network of Fig.Q3(b) below using Norton's theorem.  Fig.Q3(b)	12	L3	CO2

		OR			
4	a.	State and explain maximum power transfer when load impedance consisting of variable resistance and variable reactance.	**8**	**L2**	**CO2**
	b.	Using Millman's theorem, find the current flowing through $R_L = 10\Omega$ of the circuit as shown in Fig.Q4(b).  Fig.Q4(b)	**12**	**L3**	**CO2**
		Module – 3			
5	a.	Explain the initial and final conditions in basic elements.	**6**	**L2**	**CO3**
	b.	Obtain the expression for transient response i(t) of series R – C circuit when excited by DC supply.	**6**	**L2**	**CO3**
	c.	In the networks Fig.Q5(c), the switch K is opened at t = 0. At $t = 0^+$, solve for $V, \frac{dV}{dt}$ and $\frac{d^2V}{dt^2}$.  Fig.Q5(c)	**8**	**L3**	**CO3**
		OR			
6	a.	Obtain the expression for transient response, i(t) of series RL circuit when excited by AC supply.	**6**	**L2**	**CO3**
	b.	For the circuit shown in Fig.Q6(b), $V_C(o) = 0$. Find $i(0^+)$, $\frac{di}{dt}(0^+)$ and $\frac{d^2i}{dt^2}(0^+)$.  Fig.Q6(b)	**8**	**L3**	**CO3**
	c.	Explain initial and final conditions in RLC parallel circuit and RLC series circuit.	**6**	**L2**	**CO3**

		Module – 4			
7	a.	State and prove initial and final value theorem.	10	L3	CO3
	b.	Find the Laplace transformer of the periodic signal x(t) as shown in Fig.Q7(b).  Fig.Q7(b)	10	L3	CO3
		OR			
8	a.	Find the Laplace transformer of f(t) shown in Fig.Q8(a).  Fig.Q8(a)	10	L3	CO3
	b.	A voltage pulse of 10V and 2 sec duration is applied to the RC network shown in Fig.Q8(b). Find the current i(t).  Fig.Q8(b)	10	L3	CO3
		Module – 5			
9	a.	Derive Y-parameters interms of Z-parameters.	4	L2	CO4
	b.	Determine h-parameters of the circuit shown in Fig.Q9(b).  Fig.Q9(b)	8	L3	CO4
	c.	Prove the following expression in series resonance. $f_r = \sqrt{f_1 f_2}$.	8	L2	CO4
		OR			
10	a.	Obtain an expression for resonance frequency in a parallel resonant circuit.	4	L2	CO4
	b.	Define ABCD parameters and obtain ABCD parameters interms of h-parameters.	8	L3	CO4
	c.	A series RLC circuit has R = 50 Ω, L = 0.2H and C = 10 μF with an applied voltage of 20V. Determine : i) F_0 ii) Q_0 iii) BW.	8	L3	CO4

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BEC306A

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

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 classification of semiconductors, Insulators and metals using energy band diagram.	06	L2	CO1
	b.	Explain with neat diagram direct and indirect bandgap semiconductors.	08	L2	CO1
	c.	Consider a semiconductor bar with w = 0.1 mm , f = 10 μm and L = 5 mm. For β = 10 kg (1 kg = 10^{-5} wb/cm^2) and a current of 1 mA, we have $V_{AB} = -2$ mV and $V_{CD} = 100$ mV. Find the type, concentration and mobility of the minority carriers.	06	L3	CO1
		OR			
Q.2	a.	Show the random thermal motion of an electron in a solid and the effect of applying an electric field to it. Derive the equation which relates the current density and mobility in a semiconductor in an applied electric field.	10	L3	CO1
	b.	(i) A Si bar 1 μm long and 100 μm^2 in cross sectional area is doped with 10^{17} cm^3 phosphorous. Find the current at 300°K with 10 V applied. (ii) How long does it take an average electron to drift 1 μm in pure Si at an electric field of 100 V/cm. Repeat for 10^5 V/cm [Given μ_n=1350 cm^2/V-s]	10	L3	CO1
		Module – 2			
Q.3	a.	Analyze the effect of a bias at a P-n junction on electric field, potential particle flow and current detection at, (i) Equilibrium (ii) Forward bias (iii) Reverse bias	12	L3	CO2
	b.	Explain the avalanche breakdown phenomena in a reverse biased P-n junction with illustration and write the expression for electron multiplication.	08	L2	CO2
		OR			
Q.4	a.	Discuss the current and voltage generated in an illuminated junction with necessary illustration and derive an expression for the open circuit voltage 'V_{OC}'.	10	L3	CO2
	b.	Explain in detail the design and construction of a solar cell with a neat sketch and also discuss the Figure of Merit of a solar cell using the I-V characteristics.	10	L2	CO2

		Module – 3			
Q.5	a.	With illustration explain the operation of a BJT with respect to its I-V characteristics and also depict the flow of electrons and holes in a p-n-p transistor with proper biasing.	10	L3	CO3
	b.	Analyze the coupled diode model of a transistor with respect to the normal mode and inverted mode holes distribution components and derive the Eber-Moll equation.	10	L3	CO3
		OR			
Q.6	a.	Outline the switching effect in a common emitter transistor circuit with illustration.	10	L2	CO3
	b.	Explain the effects of base narrowing and Avalanche breakdown in a transistor.	10	L2	CO3
		Module – 4			
Q.7	a.	Discuss the small signal equivalent circuits and the frequency limitation factor and the cut-off frequency of JFET.	10	L2	CO4
	b.	Describe the ideal capacitance-voltage characteristics of the MOS capacitor and also its three operating condition.	10	L3	CO4
		OR			
Q.8	a.	Explain the operation of a P-channel depletion and enhancement type MOSFET with neat sketches.	10	L2	CO4
	b.	Explain n-channel enhance mode MOSFET with its circuit symbol.	04	L2	CO4
	c.	Explain the structure and operation of a P-n JFET by varying V_{GS} and V_{DS} independently.	06	L2	CO4
		Module – 5			
Q.9	a.	Explain the ion implantation and the chemical vapour deposition methods of fabrication of P-n junctions.	10	L2	CO5
	b.	Describe the photolithography and rapid thermal processing in the fabrication of P-n junctions.	10	L1	CO5
		OR			
Q.10	a.	Discuss the integration of Diodes, Resistors, Capacitors, Inductors in a integrated circuit technology.	10	L2	CO5
	b.	Explain the fabrication of CMOS integrated circuits using self aligned twin well process with neat sketch.	10	L2	CO5

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CBCS SCHEME

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

BEC401

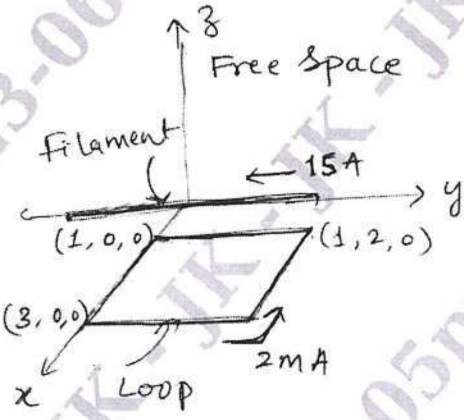
Fourth Semester B.E/B.Tech. Degree Examination, June/July 2025

Electromagnetics Theory

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.	Derive an expression for electric field intensity due to infinite the charge.	8	L2	CO1
	b.	Define Coulomb's law in the vector from and explain.	5	L1	CO1
	c.	Transform the vector field $W = 10\bar{a}_x - 8\bar{a}_y + 6\bar{a}_z$ to cylindrical co-ordinate system at point P(10, –8, 6).	7	L3	CO1
		OR			
2	a.	Define position vector and distance vector with an illustration in Cartesian system.	5	L1	CO1
	b.	A change of 1μc is at A(2, 0, 0), what charge must be placed at print B(–2, 0, 0), which will make 'y' component of total force per unit charge is zero at point C(1, 2, 2). Assume that the media is free space.	7	L3	CO1
	c.	Electric charge lies in the plane at z = –2m in the form of a square sheet described by $-2 \le x \le +2$m and $-2 \le y \le +2$m with charge density P_s of $2(x^2 + y^2 + 4)^{3/2}\eta$ c/m^2. Determine electric field intensity $\bar{E}$ at the origin.	8	L3	CO1
		Module – 2			
3	a.	If $\bar{E} = -8xy\bar{a}_x - 4x^2\bar{a}_y + \bar{a}_z V/m$, the charge of 6C is to be moved from B(1, 8, 5) to A(2, 18, 6). Find the work done. Selected path is $y = 3x^2 + z$ and $Z = x + 4$.	9	L3	CO2
	b.	State and prove Gauss law.	5	L2	CO2
	c.	Derive the expression for current continuity equation.	6	L2	CO2
		OR			
4	a.	Obtain $\bar{E}$ and $\bar{D}$ for infinite sheet of charge using Gauss law.	8	L2	CO2
	b.	Let $\bar{D} = 5r^2\bar{a}_r$ m C/m^2 for $r < 0.08$m and $\bar{D} = 0.1/r^2\bar{a}_r$ m C/m^2 for $r > 0.1$m, find : i) Volume charge density for r = 0.06m, ii) Volume charge density for r = 0.1m. Assume that $\bar{D}$ is in spherical system.	6	L3	CO2
	c.	The current density vector is given by $\bar{J} = \frac{2}{r}\cos\theta\bar{a}_r + 20e^{-2r}\sin\theta.\bar{a}_\theta$, find : i) $\bar{J}$ at $(r = 3m, \theta = 0^0, \phi = \pi)$ ii) Total current passing through the sphere with r = 3m, $0 \le \theta \le 20°$ and $0 \le \phi \le 2\pi$ in $\bar{a}_r$ direction.	6	L3	CO2
		Module – 3			
5	a.	Find $\bar{E}$ at P(3, 1, 2) for the field of two co-axial conducting cylinders with v = 50V at r = 2m and v = 20V at r = 3 m using Laplace's equation.	9	L3	CO3
	b.	Calculate the value of $\bar{J}$ if $\bar{H} = \frac{1}{\sin}\bar{a}_\theta$ at P(2, 30°, 20°).	5	L3	CO3
	c.	Deduced Poisson's and Laplace's equation using Gauss law in point form. Write Laplacian operation on 'V' for different co-ordinate system.	6	L2	CO3

			Marks	Level	CO
		OR			
6	a.	Derive the expression for magnetic field $\overline{H}$ due to infinite long straight line using Biot – Savart law.	**10**	**L2**	**CO3**
	b.	A Co-axial cable with radius of inner conductor 'a', inner radius of outer conductor 'b' and its outer radius 'c'. The outer conductor carries current + I and inner conductor carries current – I. Determine and sketch variation of $\overline{H}$ against 'r' for : i) $r < a$ ii) $a < r < b$ iii) $b < r < c$ and iv) $r > c$.	**10**	**L3**	**CO3**
		Module – 4			
7	a.	In a certain region, the magnetic flux density in a magnetic material with $X_m = 6$ is given as $\overline{B} = 0.005y^2\overline{a}_x T$ at $y = 0.4$m, find $\overline{J}, \overline{J}_b$ and $\overline{J}_T$.	**8**	**L3**	**CO4**
	b.	Derive Lorentz force equation and explain.	**5**	**L2**	**CO4**
	c.	Derive an equation for the force between the two differential current elements.	**7**	**L2**	**CO4**
		OR			
8	a.	A square loop of wire in z = 0 plane carrying 2mA in the field of an infinite filament on the y-axis as shown in the Fig.Q8(a). Find the total force on the loop.  Fig.Q8(a)	**7**	**L3**	**CO4**
	b.	Obtain the Tangential component of $\overline{B}$ and $\overline{H}$ is the boundary of two medium having the permeability of μ_1 and μ_2.	**8**	**L2**	**CO4**
	c.	Compare electric and magnetic circuits.	**5**	**L2**	**CO4**
		Module – 5			
9	a.	Explain inconsistency of current continuity equation in detail.	**7**	**L2**	**CO5**
	b.	Derive general wave equation of $\overline{E}$ and $\overline{H}$ for the media with parameters μ, $\in$ and σ.	**8**	**L2**	**CO5**
	c.	A circular loop conductor lies in z = 0 plane and has a radius of 0.1 m and resistance of 5Ω. Given $\overline{B}$=0.2 sin 10^3t Tesla, determine the current in the loop.	**5**	**L3**	**CO5**
		OR			
10	a.	Derive Maxwell's equations in integral and point form for static electric and magnetic fields using Faraday's law, Ampere's circuital law and Coulomb's law.	**8**	**L2**	**CO5**
	b.	A 9375MHz uniform plane wave is propagating in polystyrene. If the amplitude of electric field intensity is 20 V/m and the material is assumed to be lossless, find Attenuation Constant (α), phase constant (β), Wavelength (λ), Velocity of propagation (v), intrinsic impedance (η), propagation constant (γ) and amplitude of the magnetic field. For polystyrene $\mu_r = 1$ and $\in_r = 2.56$.	**6**	**L3**	**CO5**
	c.	State and explain Poynting theorem.	**6**	**L2**	**CO5**

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CBCS SCHEME

USN | | | | | | | | | | | **BEC402**

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Principles of Communication 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 Probability. Illustrate the relationship between sample space, events and probability.	6	L2	CO5
	b.	What are moments? Determine the characteristic function of a Gaussian random variable with a given mean and variance.	6	L2	CO5
	c.	Analyze the Gaussian process with Gaussian distribution curve. Infer the properties of a Gaussian process.	8	L2	CO5
		OR			
Q.2	a.	Define a random process. Interpret mean and covariance function with respect to stationary random process.	6	L2	CO5
	b.	What is Autocorrelation function? State and prove the properties of Autocorrelation function.	6	L2	CO5
	c.	Analyze the PDF and CDF of a random experiment in which three coins are tossed and condition to get random variable is getting head.	8	L3	CO5
		Module – 2			
Q.3	a.	Define Amplitude modulation. Derive an expression for Amplitude Modulation in time domain with necessary waveforms.	8	L2	CO1
	b.	A standard AM broadcast station is allowed to transmit modulating frequencies upto 5 kHz. If the AM station is transmitting on a frequency of 980 kHz, compute the maximum and minimum upper and lower side bands and the total bandwidth occupied by the AM station.	5	L3	CO1
	c.	Outline the block diagram of FDM transmitter. List the applications of FDM.	7	L2	CO1
		OR			
Q.4	a.	Develop a code to generate Amplitude Modulation Waveforms and display its spectrum.	8	L3	CO1
	b.	Apply the concept of side bands to explain DSB and SSB, draw the relevant waveforms.	5	L2	CO1
	c.	Explain with diagrams, the working principle of Lattice-type balanced modulator.	7	L2	CO1
		Module – 3			
Q.5	a.	Identify a method used to convert a Phase Modulated (PM) signal into a Frequency-Modulated (FM) signal.	6	L2	CO3
	b.	The input to an FM receives has S/N of 2.8. The modulating frequency is 1.5 kHz. The maximum permitted deviation is 4 kHz. Determine (i) The frequency deviation caused by the noise and (ii) The improved output S/N.	6	L3	CO2

	c.	Interpret with a neat circuit diagram, the working principle of frequency modulation of a crystal oscillator with a Voltage Variable Capacitor (VVC).	8	L2	CO2
		OR			
Q.6	a.	Define Modulation. Identify any five differences between Frequency Modulation and Amplitude Modulation.	6	L2	CO2
	b.	Why Pre-emphasis and de-amphasis are required? Explain how they are implemented?	6	L2	CO2
	c.	Draw the block diagram of a super heterodyne receiver and explain the function of each.	8	L2	CO2
		Module – 4			
Q.7	a.	State and prove sampling theorem. Write a program for sampling and reconstruction of low pass signals and display the signals and its spectrum.	10	L3	CO3
	b.	Infer the working of TDM system with a neat block diagram.	5	L2	CO3
	c.	Explain briefly the block diagram of PPM generator.	5	L2	CO3
		OR			
Q.8	a.	Identify and explain the basic elements of a PCM system with neat diagrams. For the data stream [0 1 1 0 1 0 0 1], draw the following line code waveforms : (i) Unipolar NRZ (ii) Polar NRZ (iii) Unipolar RZ (iv) Bipolar RZ (v) Manchestor code	10	L3	CO3
	b.	Infer the advantages of digital signals over analog signals.	5	L2	CO3
	c.	Explain briefly the midtread and midrise Quantizers with relevant figures.	5	L2	CO3
		Module – 5			
Q.9	a.	What is Intersymbol Interference (ISI)? With a neat block diagram outline the baseband binary data transmission system and write the necessary equations?	8	L2	CO4
	b.	Define SNR. Summarize the different types of external and internal noise.	7	L2	CO4
	c.	Illustrate the concept of Noise in cascaded stages with a diagram. Write Friis formula and mention its terms.	5	L2	CO4
		OR			
Q.10	a.	What is Baseband digital transmission? Explain the following concepts briefly : (i) Nyquist criterion for distortionless transmission. (ii) Baseband M-ary PAM transmission.	8	L2	CO4
	b.	Define Noise. Classify the different types of semiconductor noise.	7	L2	CO4
	c.	What is Noise Factor and Noise Figure? An RF amplifier has an S/N ratio of 8 at the input and an S/N ratio of 6 at the output. Calculate the Noise factor and Noise figure.	5	L2	CO4

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CBCS SCHEME

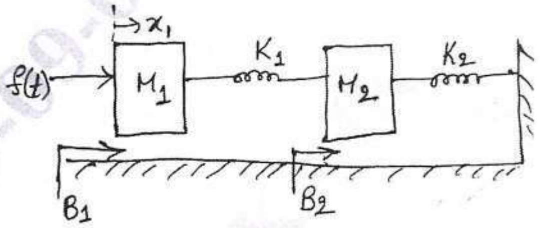
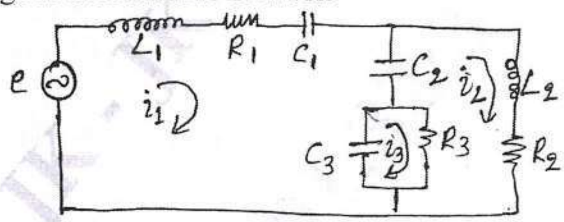
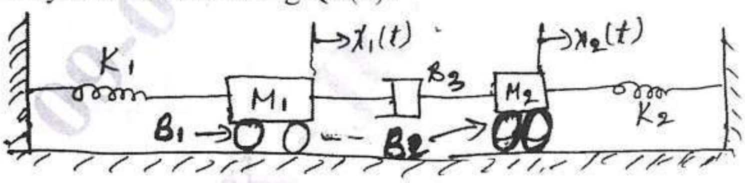
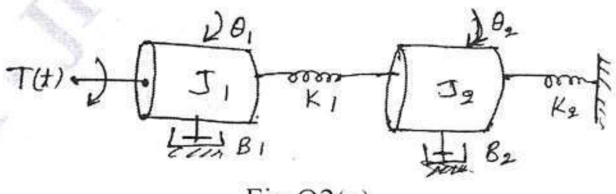
USN | | | | | | | | | | |

BEC403

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Control 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 control system with examples. Compare closed loop and open loop control systems.	06	L1 L2 L3	CO1
	b.	For the mechanical system shown in Fig.Q1(b), write the mechanical network, equilibrium equations and obtain the electrical network based on F-V analogy.  Fig.Q1(b)	08	L1 L2 L3	CO1
	c.	The force-voltage analogy of a mechanical system is shown in Fig.Q1(c). Obtain its analogous mechanical network.  Fig.Q1(c)	06	L1 L2 L3	CO1
		OR			
Q.2	a.	Explain the effect of feedback on control systems.	06	L1 L2 L3	CO1
	b.	Find the force-voltage analogous electrical network for the given mechanical system shown in Fig.Q2(b).  Fig.Q2(b)	06	L1 L2 L3	CO1
	c.	Derive the differential equation governing the mechanical rotational system shown in Fig.Q2(c). Draw the equivalent voltage and current analogy circuits.  Fig.Q2(c)	08	L1 L2 L3	CO1

Module – 2

Q.3	a.	Determine the transfer function C(S)/R(S) for the system shown in Fig.Q3(a), using block diagram reduction technique.	10	L1 L2 L3	CO2

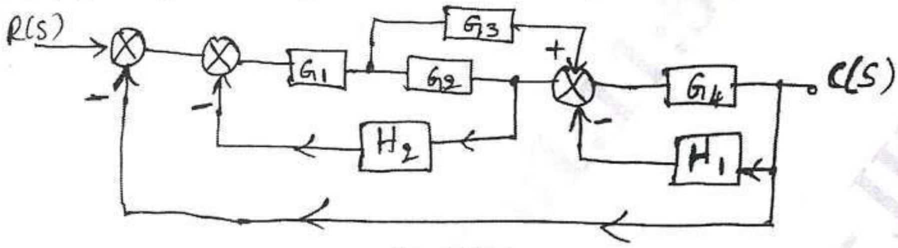


Fig.Q3(a)

	b.	Determine the overall transfer function using Mason's gain formula for the signal flow graph shown in Fig.Q3(b).	10	L1 L2 L3	CO2

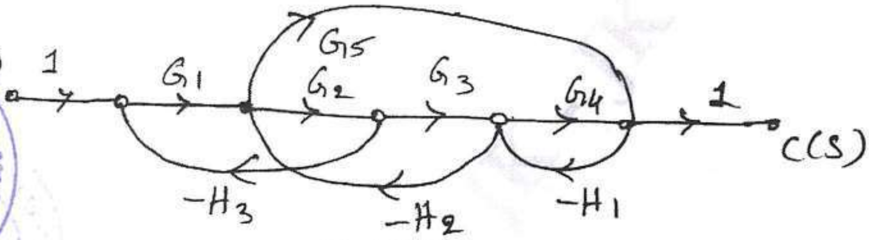


Fig.Q3(b)

OR

Q.4	a.	Find the transfer function by reducing the block diagram shown in Fig.Q4(a).	10	L1 L2 L3	CO3

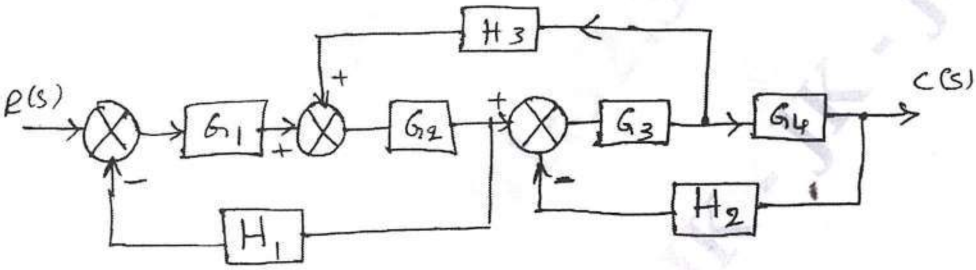


Fig.Q4(a)

	b.	Find the transfer function by using Mason's gain formula for the signal flow graph shown in Fig.Q4(b).	10	L1 L2 L3	CO2

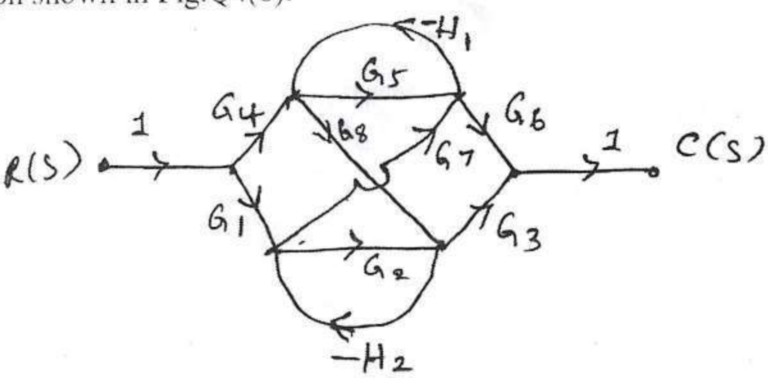
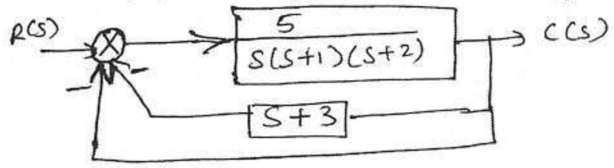


Fig.Q4(b)

Module – 3

Q.5	a.	For the system shown in Fig.Q5(a), find the (i) System type (ii) Static error constants K_p, K_v, K_a (iii) the steady state error for an input r(t) = 3 + 2t.  Fig.Q5(a)	08	L1 L2 L3	CO3
	b.	Find the step response c(t) for the system described by $\frac{C(s)}{R(s)} = \frac{4}{s+4}$ Also find time constant, rise time and settling time.	05	L1 L2 L3	CO3
	c.	Derive the equation steady state error of simple closed loop system.	07	L1 L2 L3	CO3

OR

Q.6	a.	Given a unity feedback system with $G(s) = \frac{20(1+s)}{s^2(2+s)(4+s)}$ (i) What is the type of system? (ii) Find static error coefficients. (iii) Find steady error if the input is $r(t) = 40 + 2t + 5t^2$	06	L1 L2 L3	CO3
	b.	Write the general block diagram of the following and explain : (i) PD type of controller (ii) PI type of controller	06	L1 L2 L3	CO3
	c.	Derive the response of an under damped second order system for unit step input.	08	L1 L2 L3	CO3

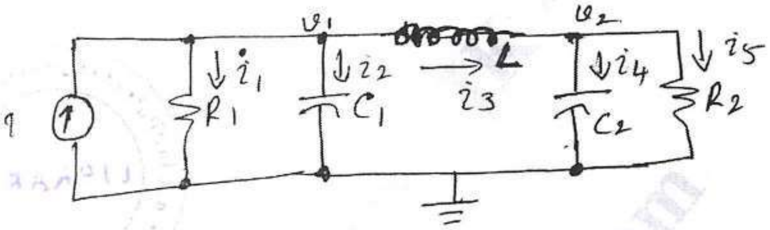
Module – 4

Q.7	a.	Mention limitations of Routh's criterion.	04	L1 L2 L3	CO4
	b.	Determine the range of K for which the system is stable such that a unity feedback system has $G(s) = \frac{K(s+13)}{s(s+3)(s+7)}$ using RH criterion. Also find closed loop, poles more negative than – 1.	08	L1 L2 L3	CO4
	c.	Check the stability of the given characteristic equation using Routh's method. $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$	08	L1 L2 L3	CO4

OR

Q.8	a.	Sketch the complete Root locus of system having $G(s)\,H(s) = \frac{K}{s(s+5)(s+10)}$	08	L1 L2 L3	CO4
	b.	Sketch the complete Root locus of system having $G(s)\,H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$	12	L1 L2 L3	CO4

Module – 5

Q.9	a.	Draw the Bode plot for the open loop transfer function of a system is $$G(s) = \frac{K(1+0.2s)(1+0.025s)}{s^3(1+0.001s)(1+0.005s)}$$ Determine that the system is conditionally stable. Find the range of K for which the system is stable.	10	L1 L2 L3	CO5
	b.	The transfer function of a system is $$G(s)\,H(s) = \frac{K}{s(s+2)(s+10)}$$ Sketch the Nyquist plot and hence calculate the range of values of K for stability.	10	L1 L2 L3	CO5
		OR			
Q.10	a.	Obtain the state model of the network shown in Fig.Q10(a) assuming $R_1 = R_2 = 1\ \Omega$, $C_1 = C_2 = 1F$, and $L = 1H$.  Fig.Q10(a)	10	L1 L2 L3	CO5
	b.	Obtain the state transition matrix for the state model whose A matrix is given by $$A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$$	10	L1 L2 L3	CO5

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CBCS SCHEME

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BEC405A

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.	With diagrams, explain the RAM structure of 8051 microcontroller.	8	L2	CO1
	b.	With necessary sketches, explain (i) Flags and program status word (ii) Stack operation.	8	L2	CO1
	c.	Write a note on Embedded Microcontrollers.	4	L1	CO1
		OR			
Q.2	a.	With a neat diagram, explain the block diagram of 8051 microcontroller.	8	L2	CO1
	b.	Write an interfacing diagram of 8051 microcontroller interfaced to 16K bytes of RAM.	8	L2	CO1
	c.	Compare CISC and RISC architecture.	4	L2	CO1
		Module – 2			
Q.3	a.	Write a program segment to copy the value 55 H into RAM memory locations 40 H to 44 H using, (i) Direct addressing mode, (ii) Register indirect addressing mode without a loop (iii) and with a loop	6	L2	CO2
	b.	Explain the following instructions with examples: (i) Move A, @A + DPTR (ii) RRC A (iii) DA A	6	L2	CO2
	c.	Briefly explain the arithmetics instructions of 8051 microcontroller.	8	L2	CO2
		OR			
Q.4	a.	Write an assembly language program to multiply the number present in external memory location 800 AH and 8050 H. Store the lower byte of result obtained in R0 and higher byte in R1.	8	L3	CO2
	b.	Explain the role of CALL and subroutines in 8051 microcontroller programming. Give an example.	4	L2	CO2
	c.	If the number A6H is placed in external RAM between locations 0100H and 0200H. Write an assembly language program to find the address of that location and place that address in R6 and R7 registers.	8	L3	CO2
		Module – 3			
Q.5	a.	Explain the functions of each bit in the TMOD register.	6	L2	CO3
	b.	Explain MODE-1 programming of timers in 8051.	6	L2	CO3
	c.	Write a 8051 C program to transmit the message 'ECE' using serial communication port of 8051. Use baud rate 4800.	8	L2	CO3

		OR			
Q.6	a.	Explain the importace of TI flag and RI flag.	6	L2	CO3
	b.	Write the steps required for programming 8051 to transmit and receive the data serially.	6	L2	CO3
	c.	Explain how timers are used as counters and also explain the counters operation using a code snippet.	8	L2	CO3
		Module – 4			
Q.7	a.	Explain the following : (i) Interrupt (ii) Interrupt Service Routine (ISR) (iii) Interrupt Vector Table (IVT)	8	L2	CO4
	b.	Write the instructions to : (i) Enable the serial interrupt, timer 0 interrupt and external hardware interrupt. (ii) Disable the timer 0 interrupt. (iii) Disable all interrupts with a single instruction. Use bit manipulation instructions for all the cases.	6	L2	CO4
	c.	Explain the bit contents of IE register.	6	L2	CO4
		OR			
Q.8	a.	List the steps involved in executing interrupts in 8051 microcontroller.	6	L2	CO4
	b.	Assume XTAL = 11.0592 MHz. Use timer 0 to create the square wave. Write a assembly program that continuously gets a 8 bit of data from P(0) and sends it to P(1). While simultaneously creating square wave of 200 μs period on P2.5.	8	L3	CO4
	c.	Write the interrupt priority upon reset in 8051. Also explain how the priority of the interrupts can be set using IP register.	6	L2	CO4
		Module – 5			
Q.9	a.	With neat diagram, write an assembly language program to interface stepper motor to 8051 microcontroller.	10	L3	CO5
	b.	Explain DAC interface with diagram and also write program to generate triangular waveform.	10	L3	CO5
		OR			
Q.10	a.	With neat diagram, write an assembly language program to interface LCD to 8051 microcontroller.	10	L3	CO5
	b.	A door sensor is connected to the P1.1 pin and a buzzer is connected to P1.7. Write 8051 C program to monitor the door sensor and when it opens, sound the buzzer. The buzzer can be sound by sending a square wave of a few hundred Hz.	10	L2	CO5

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CBCS SCHEME

USN | | | | | | | | | | | **BEC501**

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

Technological Innovation and Management Entrepreneurship

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 management. Explain any 4 management functions.	10	L2	CO1
	b.	List and explain management skills with the help of skill-mix diagram.	10	L2	CO1
		OR			
Q.2	a.	What is planning? Explain various steps involved in planning.	7	L2	CO1
	b.	Explain 10 different roles played by manager.	8	L2	CO1
	c.	Relate programmed and non-programmed decision.	5	L2	CO1
		Module – 2			
Q.3	a.	With the help of a diagram, explain Maslow's need hierarchy theory with examples.	10	L2	CO2
	b.	Define Recruitment. Explain the steps involved in the selection process.	10	L2	CO2
		OR			
Q.4	a.	Explain span of management concept and its importance.	10	L2	CO2
	b.	Discuss the purpose of communications.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain benefits and limitations of social audit.	10	L2	CO3
	b.	Explain corporate governance in India.	10	L2	CO3
		OR			
Q.6	a.	What are the essential characteristics that define a successful entrepreneur?	10	L1	CO3
	b.	Explain key stages of the entrepreneurial development cycle.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain impact of globalization and WTO on SSI in India.	10	L2	CO4
	b.	Discuss the problems faced by small scale industries.	10	L2	CO4

		OR			
Q.8	**a.**	Outline financial feasibility and technical feasibility.	**10**	**L2**	**CO4**
	b.	What factors contribute to creating favorable business opportunities in India?	**10**	**L1**	**CO4**
		Module – 5			
Q.9	**a.**	Explain steps in PERT and limitations of PERT.	**10**	**L2**	**CO5**
	b.	Explain the challenges faced by entrepreneurs, when starting their own business.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Outline the importance of network analysis.	**5**	**L2**	**CO5**
	b.	Distinguish between PERT and CPM.	**5**	**L2**	**CO5**
	c.	Explain the government schemes for funding business.	**10**	**L2**	**CO5**

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CBCS SCHEME

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

BEC502

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
Digital Signal Processing

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.	Estimate the signal x[n] in terms of its odd and even components.	4	L2	CO1
	b.	Classify whether each of the following signal is periodic or not. If periodic determine its fundamental period: i) $x_1(n) = \cos(2n)$ ii) $x_2(n) = \sin(3\pi n)$	6	L2	CO1
	c.	Predict whether the given system y[n] = x[n] + nx[n + 1] is static / dynamic, linear or non linear, time invariant or time variant, causal or non causal and stable or unstable. Justify your statements.	10	L3	CO1
		OR			
Q.2	a.	Distinguish between continuous and discrete signal. Compute the convolution of two finite sequence x[n] = [-1, 4, 2, 1] and h[n] = [1, 2, 3, 5].	10	L2	CO1
	b.	Write a program to perform the following operations on i) signal addition and ii) multiplication.	4	L3	CO1
	c.	Interpret whether each of the following signal is energy or power signal: i) $x(n) = 1; \quad \lvert n \rvert \le 1$ $\quad = 0; \quad$ otherwise ii) $x(n) = u(n)$	6	L3	CO1
		Module – 2			
Q.3	a.	Calculate Z transform and ROC of the sequence $x(n) = a^n u(n)$.	5	L2	CO2
	b.	Write a program to compute N-point DFT and plot magnitude and phase spectrum.	5	L2	CO2
	c.	Interpret the process of frequency domain sampling and reconstruction of discrete time signals.	10	L2	CO2
		OR			
Q.4	a.	Describe any 5 properties of Z-transform with respect to ROC. Explain the periodicity and linearity DFT property.	10	L2	CO2
	b.	Compute 4-point DFT of the signal x[n] = [0, 1, 2, 3] using matrix method.	4	L2	CO2
	c.	Develop the equation for DFT of multiplication of 2 sequences.	6	L3	CO2

			Marks	Level	CO
		Module – 3			
Q.5	**a.**	Explain the circular time shift property.	5	L2	CO3
	b.	Calculate the circular convolution using the following sequences $x_1[n] = [2, 1, 2, 1]$ and $x_2[n] = [1, 2, 3, 4]$.	5	L2	CO3
	c.	Compute the 8-point DFT of the sequence x[n] = [1, 1, 0, 0, -1, -1, 0, 0] using DIT-FFT algorithm.	10	L2	CO3
		OR			
Q.6	**a.**	Calculate the output y[n] of a filter whose impulse response is h[n] = [3, 2, 1, 1] and the input signal to the filter x[n] = [1, 2, 3, 3, 2, 1, -1, -2, -3, 5, 6, -1, 2, 0, 2, 1] using overlap add method. Assuming the length of block as 7.	10	L3	CO3
	b.	An FIR filter has the impulse response of h[n] = [1, 2, 3]. Determine the response of the input x[n] = [1, 2]. Use DFT and IDFT and verify the result using direct computation of linear convolution.	10	L3	CO3
		Module – 4			
Q.7	**a.**	Determine the filter coefficients hd(n) and h(n) frequency response of low pass FIR filter for the desired frequency response. $H_d(e^{jw}) = e^{-j2w} \quad \lvert w \rvert < \pi/4$ $= 0 \quad \frac{\pi}{4} < \lvert w \rvert < \pi$ using the rectangular window with window length M = 5.	10	L3	CO4
	b.	Explain the Gibb's phenomenon.	4	L2	CO4
	c.	Realize the linear phase FIR filter with the following impulse response and give necessary equations $h(n) = \delta(n) + \frac{1}{2}\delta(n-1) - \frac{1}{4}\delta(n-2) + \frac{1}{2}\delta(n-3) + \delta(n-4)$	6	L3	CO4
		OR			
Q.8	**a.**	Develop a high pass FIR filter using Hamming window with cutoff frequency of 1.2 rad/sec and N = 9.	10	L3	CO4
	b.	Construct direct and cascade realization of system function $H(z) = 1 + \frac{5}{2} z^{-1} + 2z^{-2} + 2z^{-3}$	10	L3	CO4
		Module – 5			
Q.9	**a.**	Summarize how the first order analog low pass filter prototype is transformed into a different types of filter.	5	L2	CO2
	b.	Discuss the general mapping properties of Bilinear transformation and show the mapping between the s-plane and z-plane.	5	L2	CO5

	c.	Build a second order digital Lowpass Butter worth filter with a cutoff frequency of 3.4 kHz at a sampling frequency of 8000 Hz. Draw the direct form – II structure of this filter use bilinear transformation.	10	L3	CO5
		OR			
Q.10	a.	Illustrate the following digital systems using direct form – 1 and direct form – II $y(n)=\frac{3}{4}y(n-1)-\frac{1}{8}y(n-2)+x(n)+\frac{1}{2}x(n-1)$	10	L3	CO5
	b.	The normalized lowpass filter with a cut off frequency of 1 rad/sec is given as $H_p(s)=\frac{1}{s+1}$ use a given $H_p(s)$ and the BLT to design a corresponding digital IIR lowpass filter with a cut off frequency of 50 Hz and a sampling rate of 90 Hz.	10	L3	CO5

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CBCS SCHEME

USN | | | | | | | | | | **BEC503**

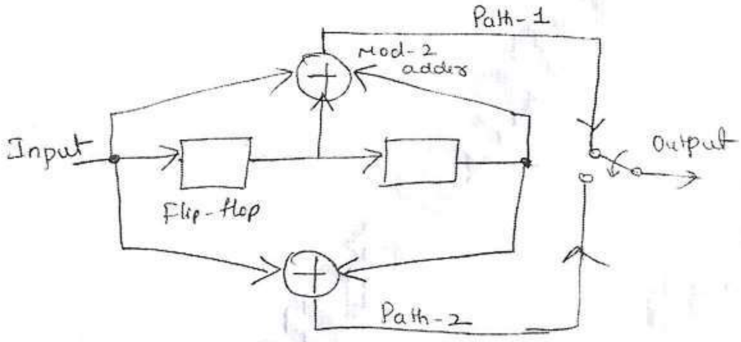
Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025
Digital Communication

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 the properties of Hilbert transform.	6	L2	CO1
	b.	Describe preenvelope of low pass signal.	4	L2	CO1
	c.	Outline the steps for deriving and reconstructing the band pass signal from in-phase and quadrature components.	10	L2	CO1
		OR			
Q.2	a.	Discuss correlation receiver of AWGN channel.	7	L2	CO1
	b.	Describe the matched filter with a necessary diagram.	8	L2	CO1
	c.	Relate signal representation of 2 BIQ code.	5	L2	CO1
		Module – 2			
Q.3	a.	Illustrate BPSK using coherent detection with transmitter and receiver and deriving expression for error probability function.	10	L2	CO2
	b.	Interpret the working of coherent generation and detection of QPSK. Draw QPSK w/fm for I/P binary sequence 01101000.	10	L2	CO2
		OR			
Q.4	a.	Demonstrate M-ary QAM M = 4 with signal space diagram.	10	L2	CO2
	b.	Discuss the working of FSK coherent receiver and transmitter with block diagram.	10	L2	CO2
		Module – 3			
Q.5	a.	International Morse code uses a sequence of dots and dashes to transmit letters of English alphabet. The dash is represented by a current pulse that has a duration of 3 units and the dot has a duration of 1 unit. The probability of occurrence of a dash is 1/3 of probability of occurrence of a dot. i) Calculate information content of dot and dash. ii) Calculate average information in the dot-dash-code. iii) Assume that dot last 1m sec, which is the same-time interval as the pause between symbols. Find average rate of information transmission.	8	L3	CO3

	b.	A binary source is emitting an independent sequence of 0's and 1's with probabilities P and 1-P outline the entropy of source, with a diagram.	5	L2	CO3
	c.	Show that entropy of 2 MS is given by $H(s^2)=2H(s)$ considering $P_0=\frac{1}{2}$, $P_1=\frac{1}{4}$, $P_2=\frac{1}{4}$.	7	L2	CO3
		OR			
Q.6	a.	Summarize properties of mutual information.	6	L2	CO3
	b.	Construct Huffman tree with symbols $\{S_0, S_1, S_2, S_3, S_4\}$ having probabilities {0.4, 0.2, 0.2, 0.1, 0.1}.	7	L3	CO3
	c.	A binary symmetric channel has matrix $P(Y/X)=\begin{bmatrix}0.8 & 0.2\\ 0.2 & 0.8\end{bmatrix}$ Also $P(X_1) = 0.6$ $P(X_2) = 0.4$. Calculate I(X, Y) C_S, η_{ch}.	7	L3	CO3
		Module – 4			
Q.7	a.	Illustrate different error correcting codes.	5	L2	CO4
	b.	Outline the procedure of syndrome decoding.	6	L2	CO4
	c.	Illustrate encoding procedure (n, k) cyclic code steps considering linear feedback shift register with (n-k) stages.	9	L2	CO4
		OR			
Q.8	a.	Define G and H matrix show that $C.H^T = 0$.	5	L2	CO4
	b.	For (6, 3) linear block code the parity matrix is $P=\begin{bmatrix}1 & 0 & 1\\ 0 & 1 & 1\\ 1 & 1 & 0\end{bmatrix}$ i) Calculate the generator matrix ii) Compute all possible code words.	10	L3	CO4
	c.	A (15, 5) cyclic code has the generator polynomial given by $g(x) = 1 + x + x^2 + x^4 + x^5 + x^8 + x^{10}$. Construct the block diagram of encoder and syndrome calculator.	5	L3	CO4
		Module – 5			
Q.9	a.	Consider a (3, 1, 2) convolutions encoder with $g^{(1)} = 110$, $g^{(2)} = 101$, $g^{(3)} = 111$ i) Build the encoder diagram. ii) Compute the code word for message sequence (11101).	14	L3	CO5

	b.	Consider convolutional encoder shown in Fig.Q.9(b). Compute the generator polynomial, output polynomial for path1 and path2. Also compute encoded sequence.  Fig.Q.9(b)	6	L3	CO5
		OR			
Q.10	a.	Interpret optimum decoding of convolutional codes.	6	L3	CO5
	b.	Apply viter bi decoder algorithm steps considering all-zero sequence (0100010000).	14	L3	CO5

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CBCS SCHEME

USN | | | | | | | | | |

BEC602

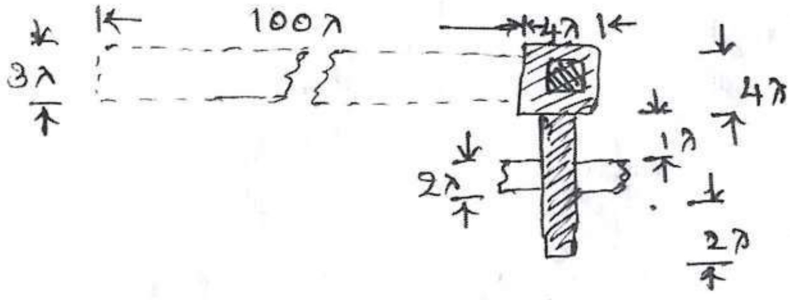
Sixth Semester B.E/B.Tech. Degree Examination, June/July 2025
VLSI Design and Testing

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.	Compare CMOS and NMOS logic.	5	L3	CO1
	b.	With neat diagram, explain the physical representation of transmission gate.	5	L2	CO1
	c.	Design CMOS compound gate for the functions : i) $Y = \overline{A(B+C)+DE}$ ii) $Y = \overline{A}B + A\overline{B}$.	10	L3	CO1
		OR			
2	a.	Design D-flip-flop using transmission gates and explain its operation with necessary conditions on LD input.	7	L3	CO1
	b.	Illustrate different alternate circuit representations used in digital circuit designs with an example for each.	6	L2	CO1
	c.	With a neat diagram, explain the physical representation of CMOS inverter.	7	L2	CO1
		Module – 2			
3	a.	With neat diagram, explain the working of nMOS enhancement mode transistor under various voltage conditions.	6	L2	CO2
	b.	How does body effect influences threshold voltage? What are the design strategies to minimize body effect?	6	L2	CO2
	c.	For an nMOSFET, derive the equation for drain current in linear and saturation region.	8	L3	CO2
		OR			
4	a.	Explain the working of pseudo nMOS inverter. Find the output voltage equation for pseudo nMOS inverter.	6	L3	CO2
	b.	Find the expression for V_{out} in region C of CMOS inverter transfer characteristics.	8	L3	CO2
	c.	Illustrate with suitable sketch, latup phenomenon in CMOS circuits and also explain its prevention.	6	L2	CO2
		Module – 3			
5	a.	Illustrate with neat diagram wafer processing and selective diffusion.	6	L2	CO3
	b.	Derive the equation for rise time, fall time and delay time.	8	L3	CO3
	c.	Explain with neat diagram, the process flow of fabricating inverter (CMOS) using Twin-tub process.	6	L2	CO3

BEC602

		OR			
6	a.	What is sheet resistance? Estimate the sheet resistance for a given layer having length 'L' and width 'W'.	7	L4	CO3
	b.	Explain the various capacitances in MOS transistor.	6	L2	CO3
	c.	Estimate the total capacitance for the structure as shown in below Fig.Q6(c).  Fig.Q6(c)	7	L4	CO3
		Module – 4			
7	a.	Differentiate static and dynamic CMOS circuit with relevant diagrams.	7	L3	CO4
	b.	Explain the percharge and evaluate phase in dynamic logic.	6	L2	CO4
	c.	Design a CVSL (Cascade Voltage Switch Logic) based XOR gate.	7	L3	CO4
		OR			
8	a.	Design a 2 : 1 multiplexer using pass transistor logic.	7	L3	CO4
	b.	Draw and explain the layout diagram of a 2 input NAND gate.	6	L2	CO4
	c.	Design a schematic and layout for $Z = \overline{(A + B + CD)}$ using Euler's graph.	7	L3	CO4
		Module – 5			
9	a.	With appropriate neat diagram of two inverter bistable element, explain in detail the voltage transfer characteristics (VTC) and potential energy analogy.	7	L2	CO5
	b.	Explain the operation of SR latch using CMOS NAND2 gates and switch level diagram.	6	L2	CO5
	c.	With neat appropriate diagrams, explain the clocked JK – Latch using NOR2 gates.	7	L2	CO5
		OR			
10	a.	What is structured design strategy? Explain the factors modularity, regularity and locality.	7	L2	CO5
	b.	Distinguish self-test and built-in test with examples.	6	L3	CO5
	c.	Explain with neat diagram, Gate Array Design flow.	7	L2	CO5

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CBCS SCHEME

USN | | | | | | | | | | | **BEC302**

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Digital System Design Using Verilog

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) Canonical SOP ii) Canonical POS iii) Essential Prime Implicant (EPI) iv) Prime Implicant (PI) v) Min term and Max term with a table of two input variable representation	10	L1	CO1
	b.	Using Quine Mccluskey method and PI reduction table, determine the minimal SOP expression for the following function. $Y = f(a, b, c, d) = \Sigma(1, 2, 3, 5, 9, 12, 14, 15) + \Sigma d(4, 8, 11)$	10	L3	CO1
		OR			
Q.2	a.	Explain the procedure to place SOP and POS equations into canonical form convert the following equations into canonical forms i) $T = f(a, b, c) = (a + b')(b' + c)$ ii) $G = f(w, x, y, z) = w'x + yz'$	10	L3	CO1
	b.	Solve the given functions using Kamangh Map i) $F = f(w, x, y, z) = \Sigma(0, 7, 8, 9, 10, 12) + \Sigma d(2, 5, 13)$ ii) $G = f(a, b, c, d) = \pi(0, 4, 5, 7, 8, 9, 11, 12, 13, 15)$ Also identify the prime implicants.	10	L3	CO1
		Module – 2			
Q.3	a.	Implement the function using multiplexers i) $f(x, y, z) = \Sigma m(0, 2, 3, 5)$ using 4×1 multiplexer ii) $f(w, x, y, z) = \Sigma m(0, 1, 5, 6, 7, 9, 12, 15)$ using 8×1 multiplexer.	10	L2	CO2
	b.	Explain the concept of carry look ahead adder with related equation and block diagram.	10	L2	CO2
		OR			
Q.4	a.	Using a 4-bit binary adder, design a logic to convert a decimal digit in 8421 code into a decimal adder.	10	L3	CO2
	b.	Implement the following functions using 3 : 8 decoder. i) $P = f(w, x, y, z) = \Sigma(1, 4, 8, 13)$ $Q = g(w, x, y, z) = \Sigma(2, 7, 13, 14)$ ii) $A = f(x, y, z) = \pi(0, 1, 3, 5)$ $B = f(x, y, z) = \Sigma(1, 4, 5, 7)$	10	L3	CO2

<table>
<tr><td colspan="6">Module – 3</td></tr>
<tr><td>Q.5</td><td>a.</td><td>Explain master slave JK flip-flop with the help of circuit diagram and timing diagrams.</td><td>10</td><td>L2</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>Design a synchronous Mod -6 counter with sequence 0-2-3-6-5-1 using JK flip-flop.</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.6</td><td>a.</td><td>Design a 4-bit binary ripple up counter with logic diagram and counting sequence and explain its operation.</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>With the help of logic diagram and counting sequence, explain.
i) Ring counter
ii) Mod – 8 twisted ring counter.</td><td>10</td><td>L2</td><td>CO3</td></tr>
<tr><td colspan="6">Module – 4</td></tr>
<tr><td>Q.7</td><td>a.</td><td>What are the different data types in verilog. Explain with examples.</td><td>10</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>i) Develop a verilog program to implement 2×1 multiplexer using conditional operator. Also write the truth table of 2×1 mux
ii) Design a 2×1 multiplexer using dataflow verilog description draw a logic diagram and logic gate level circuit for it.</td><td>4
6</td><td>L3
L3</td><td>CO4
CO4</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.8</td><td>a.</td><td>Discuss in detail different description styles in verilog.</td><td>8</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>Let A = 5' b11011, B = 5' b 10101 C = 4' d3
Determine the output the following verilog statements.
i) d = & A ii) e = ~^ 4' b1011 iii) f = ~ (A & (~B))
iv) g= A| |B v) b = 3** 2 vi) i = {2{A}}</td><td>12</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>Design a 4-bit counter with synchronous hold using verilog. Also draw the simulation waveform.</td><td>10</td><td>L3</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>Explain the operation of positive edge triggered JK flip-flop by using a verilog code using case statement. Write truth table and timing diagram.</td><td>10</td><td>L2</td><td>CO5</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.10</td><td>a.</td><td>Explain the operation of half adder and implement using structural description in verilog.</td><td>6</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>Write the verilog format of case statement and explain.</td><td>4</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>c.</td><td>Develop a verilog behavioral description for 3 bit binary up counter.</td><td>6</td><td>L3</td><td>CO5</td></tr>
<tr><td></td><td>d.</td><td>Develop a verilog program for D latch using behavioral description style.</td><td>4</td><td>L3</td><td>CO5</td></tr>
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CBCS SCHEME

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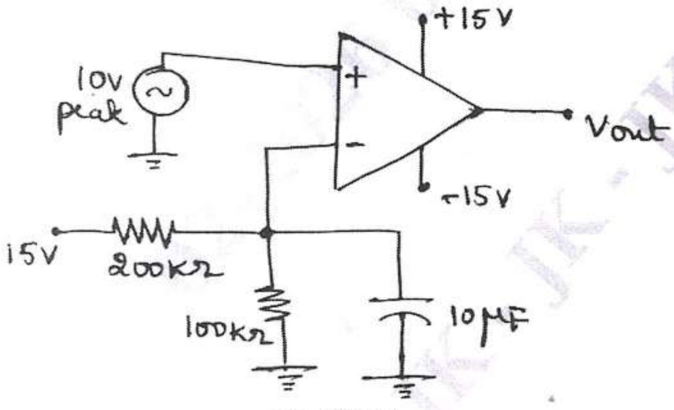
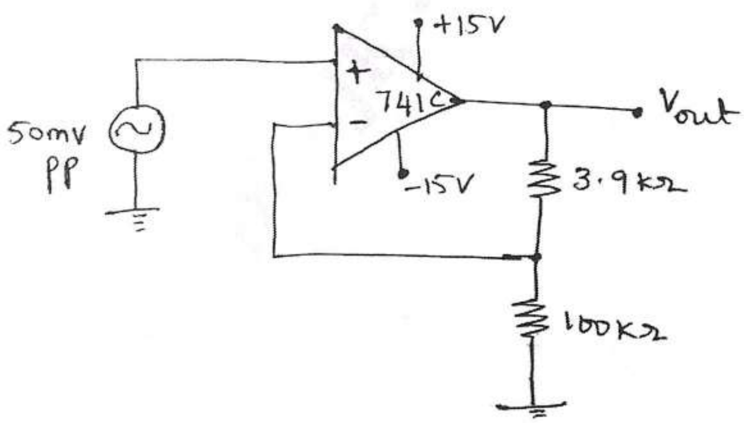
BEC303

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Electronic Principles and Circuits

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.	Develop an expression for the operating point I_C and V_{CE} for the voltage divider bias circuit using approximate analysis. Hence calculate the operating point for the VDB circuit given : $V_{CC} = 10V$, $R1 = 10K\Omega$, $R2 = 2.2\ K\Omega$, $R_C = 3.6K\Omega$, $R_E = 1\ K\Omega$.	10	L3	CO1
	b.	For the voltage divider biased amplifier, derive the expression for the voltage gain from i) π –Model ii) T –Model.	10	L2	CO1
		OR			
Q.2	a.	Develop an expression for voltage gain and input impedance for an emitter follower with neat circuit diagram.	10	L2	CO1
	b.	Determine the operating point for two supply emitter bias circuit given : $V_{CC} = 10V$, $R_C = 3.6\ K\Omega$, $R_B = 2.1\ K\Omega$, $R_E = 1\ K\Omega$ and $-V_{EE} = -2V$.	5	L2	CO1
	c.	Develop an expression for the operating point I_C and V_{CE} for collector feedback bias circuit.	5	L2	CO1
		Module – 2			
Q.3	a.	With neat circuit diagrams, explain biasing of MOSFET by fixing the gate voltage.	10	L2	CO2
	b.	With neat circuit diagram, develop an expression for voltage gain, input impedance and output impedance for common source amplifier with source resistance.	10	L2	CO2
		OR			
Q.4	a.	With neat circuit diagram, develop an expression for voltage gain, input impedance and output impedance for common gate amplifier.	10	L2	CO2
	b.	Define transconductance and hence develop any three expressions for transconductance.	10	L2	CO4

		Module – 3			
Q.5	**a.**	With neat circuit diagram, explain the operation of R-2R digital to analog converter.	**6**	**L2**	**CO4**
	b.	For the circuit shown in Fig.Q5(b) the input voltage is a sine wave with peak value of 10V. What is the trip point of the circuit? Determine the cut off frequency of bypass capacitor. Also draw the input output waveform.  Fig.Q5(b)	**6**	**L3**	**CO4**
	c.	Explain the operation of inverting Schmitt-trigger with neat circuit diagram and waveform.	**8**	**L2**	**CO4**
		OR			
Q.6	**a.**	Make use of the concept of lead-lag circuit to explain the operation of Wein bridge oscillator.	**10**	**L2**	**CO4**
	b.	Explain the operation of Astable Multi-Vibrator using 555 timer with internal block diagram and waveforms.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	With neat block diagram, explain four types of negative feedback circuit.	**8**	**L2**	**CO3**
	b.	For the circuit shown in Fig.Q7(b), calculate the feedback fraction, the ideal closed loop voltage gain, the percent error and the exact closed loop voltage gain, use the open loop gain of 741C as 100,000.  Fig.Q7(b)	**6**	**L2**	**CO3**
	c.	With neat circuit diagram and equations, explain the operation of a current amplifier.	**6**	**L2**	**CO3**

		OR			
Q.8	**a.**	Classify filters and explain each filter with its ideal frequency response.	**10**	**L2**	**CO3**
	b.	What is First Order Filters? Explain the various implementation of first order low pass and high pass active filters with expressions.	**10**	**L2**	**CO3**
		Module – 5			
Q.9	**a.**	Explain the operation of class–B push pull emitter follower amplifier with its advantages and disadvantages.	**10**	**L2**	**CO5**
	b.	Discuss the concepts of DC and AC load line taking voltage divider bias amplifier as an example.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the working of SCR phase control with the help of circuit and waveform.	**10**	**L2**	**CO5**
	b.	Explain the construction, control and advantages of Insulated-Gate Bipolar Transistor (IGBT).	**10**	**L2**	**CO5**

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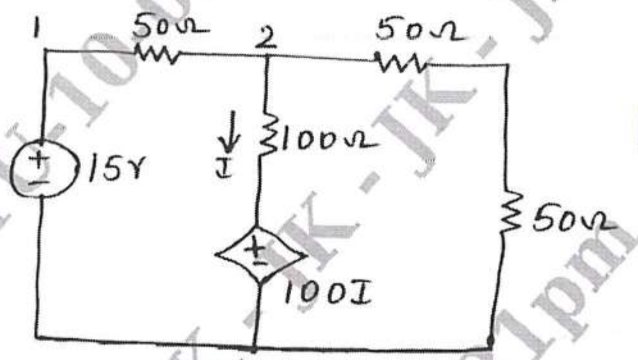
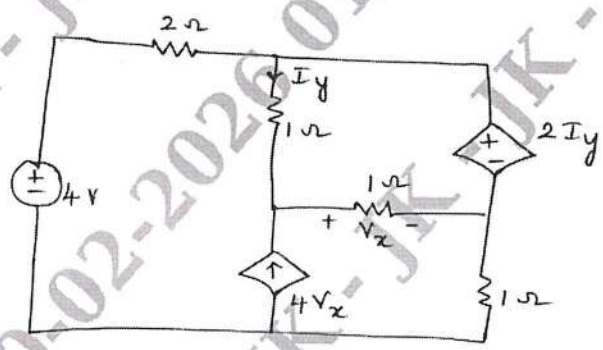
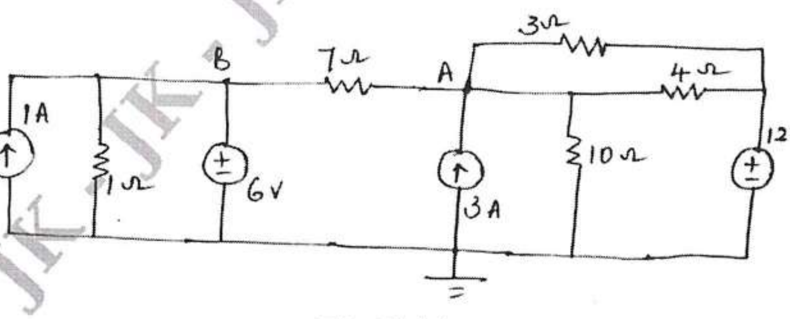
CBCS SCHEME

USN | | | | | | | | | | | **BEC304**

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Network Analysis

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.	Make use of source transformation technique, to find the voltage V_2 at node 2 in the circuit shown in Fig.Q1(a).  Fig.Q1(a)	5	L3	CO1
	b.	Using Mesh analysis, find the power absorbed by 2 Ω resistor in the circuit shown in Fig.Q1(b).  Fig.Q1(b)	8	L3	CO1
	c.	Apply node analysis to find V_A for the network shown in Fig.Q1(c).  Fig.Q1(c)	7	L3	CO1

OR

Q.2	a.	Find the equivalent resistance, between A and B using star – delta transformation for the circuit shown in Fig.Q2(a).	7	L3	CO1

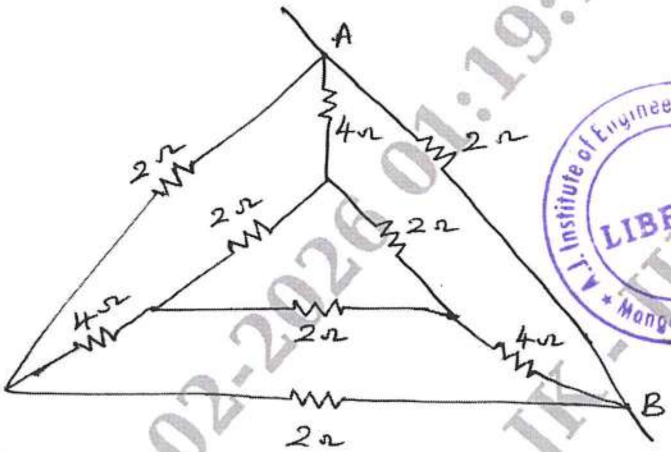


Fig.Q2(a)

	b.	Reduce the network shown in Fig.Q2(b), to find the current 'I' using source shifting and source transformation.	7	L3	CO1

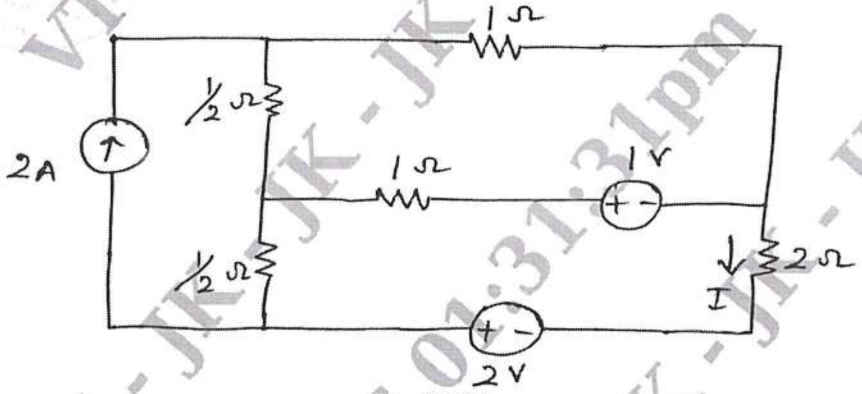


Fig.Q2(b)

	c.	Find the power delivered by the dependent voltage source in the network shown in Fig.Q2(c) using Node analysis.	6	L3	CO1

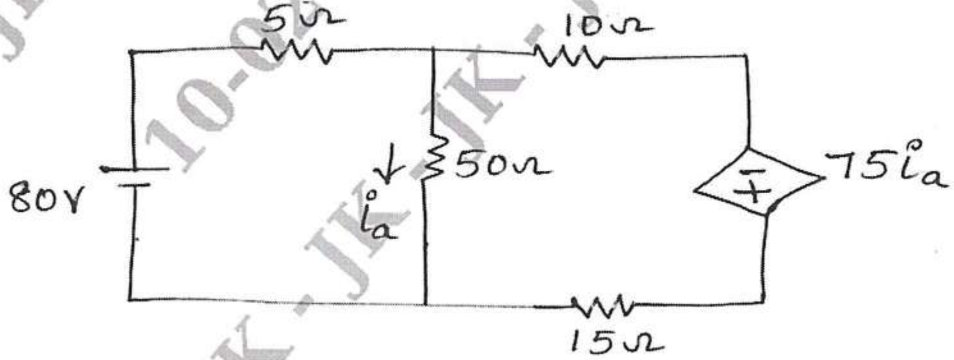


Fig.Q2(c)

Module – 2

Q.3 **a.** Use superposition theorem, to find the current 'i' for the circuit shown in Fig.Q3(a). — **6** | **L3** | **CO2**

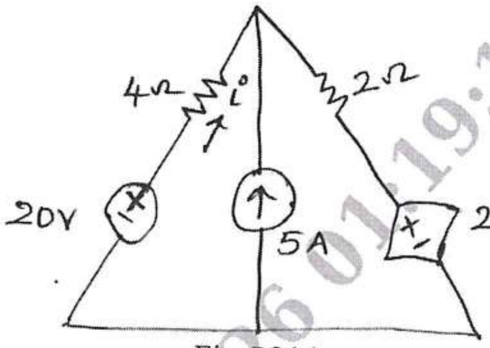


Fig.Q3(a)

b. Use Millman's theorem, to find current flowing through (2 + j3)Ω impedance, for the circuit given in Fig.Q3(b). — **6** | **L3** | **CO2**

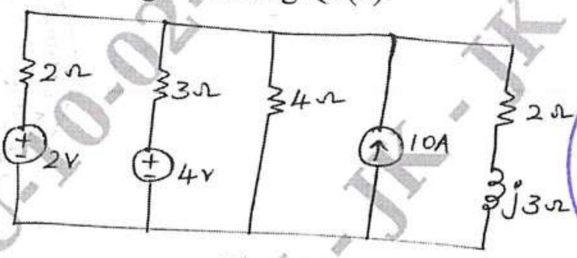


Fig.Q3(b)

c. State and find the condition for maximum power transfer in a AC circuit when load impedance is the invariable (Z_L). — **8** | **L2** | **CO2**

OR

Q.4 **a.** Use Thevenin's theorem, to find the current through 'R_L' for the network shown in Fig.Q4(a). — **7** | **L3** | **CO2**

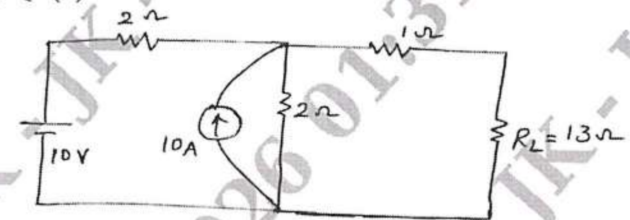


Fig.Q4(a)

b. Apply Norton's theorem to find the current through 16Ω resistor for the circuit shown in Fig.Q4(b). — **7** | **L3** | **CO2**

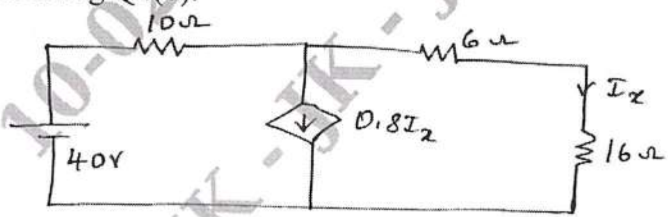


Fig.Q4(b)

c. Using Millman's theorem, find I_L through R_L for the network shown in Fig.Q4(c). — **6** | **L3** | **CO2**

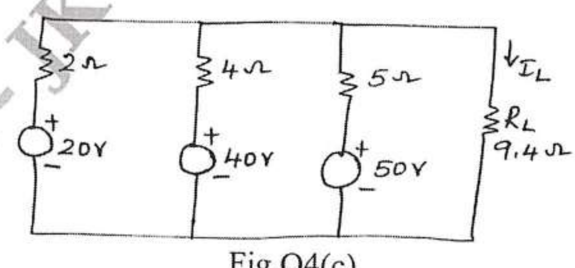


Fig.Q4(c)

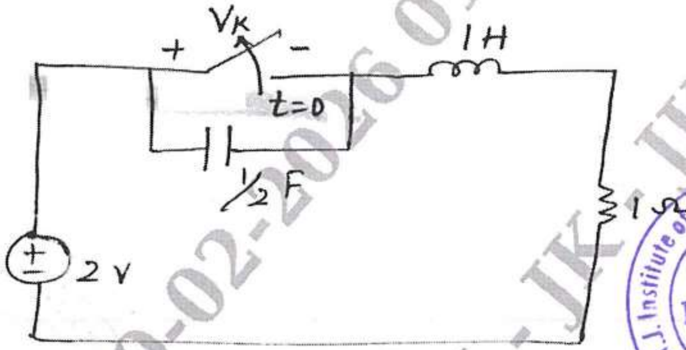
<table>
<tr><td colspan="6" align="center">Module – 3</td></tr>
<tr><td>Q.5</td><td>a.</td><td>Explain the transient behavior of the Resistance, Inductance and Capacitor.</td><td>10</td><td>L2</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>The circuit is in steady state with switch K closed for the circuit shown in Fig.Q5(b). At t = 0, the switch is opened. Find the voltage across the switch V_K, $\frac{dV_K}{dt}$ at t = 0+.


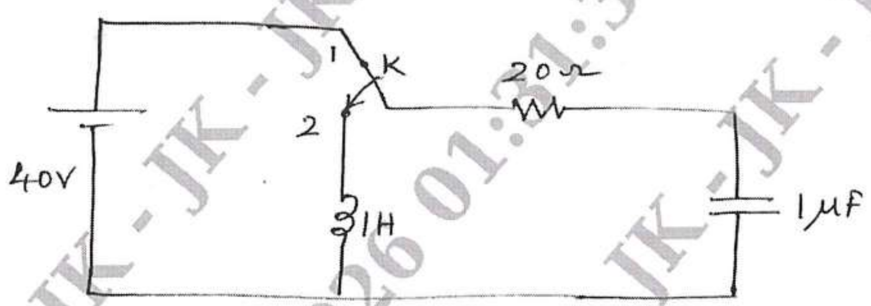
Fig.Q5(b)</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td colspan="6" align="center">OR</td></tr>
<tr><td>Q.6</td><td>a.</td><td>In the circuit shown in Fig.Q6(a), the switch K is changed from Position-1 to Position-2 at t = 0, steady state having been reached before switching. Evaluate i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0+.


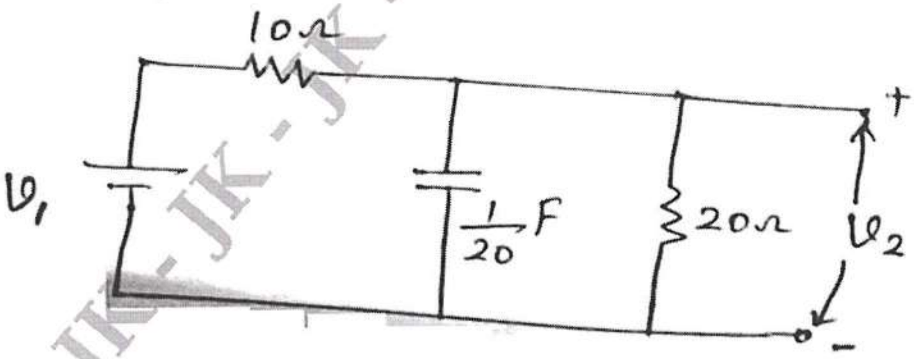
Fig.Q6(a)</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>In the circuit shown in Fig.Q6(b), $V_1(t) = e^{-t}$ for $t \geq 0$ and is zero for all $t < 0$. If the capacitor is initially uncharged, determine the value of $\frac{dV_2}{dt}, \frac{d^2V_2}{dt^2}, \frac{d^3V_2}{dt^3}$ at t = 0+.


Fig.Q6(b)</td><td>10</td><td>L3</td><td>CO3</td></tr>
</table>

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Module – 4

Q.7 a. Find the Laplace transform of the following functions : | 6 | L3 | CO3 |

i) $t.e^{-at}$

ii) $\cos^3 3t$

iii) $\frac{1}{2a^2}\sin h\, a\, t \sin a\, t$.

b. Find the Laplace transform of the following functions : | 6 | L3 | CO3 |

i. Unit step function

ii. Ramp function.

c. Obtain the Laplace transform of the f(t) shown in Fig.Q7(c). | 8 | L3 | CO3 |

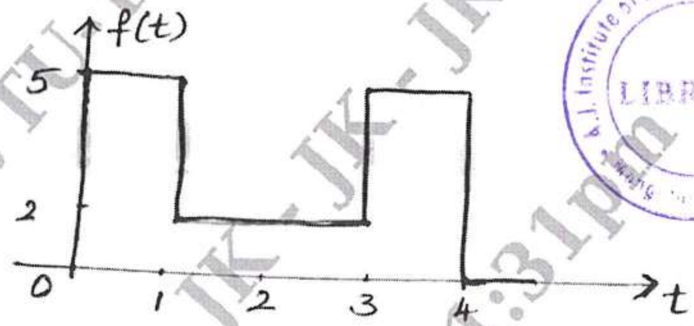


Fig.Q7(c)

OR

Q.8 a. Find the Laplace transform of the periodic waveform shown in Fig.Q8(a). | 10 | L3 | CO3 |

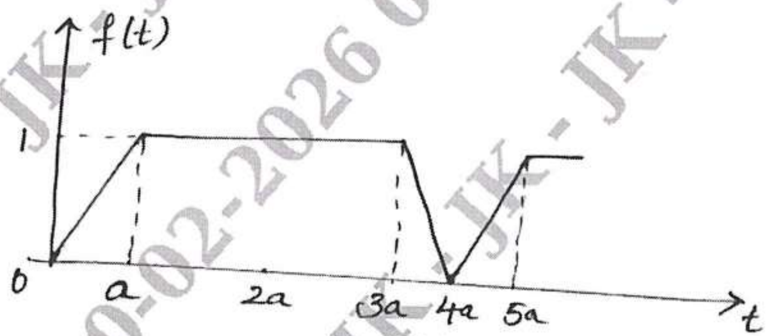


Fig.Q8(a)

b. Find the current i(t) when switch K is opened at t = 0 having reached steady state before the switching and the circuit is as shown in Fig.Q8(b). Also find the current at t = 0.5 sec. | 10 | L3 | CO3 |

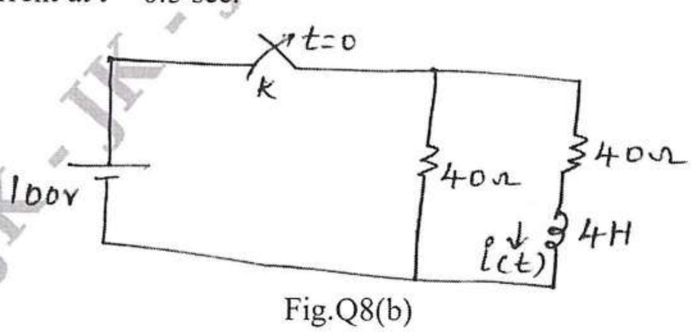
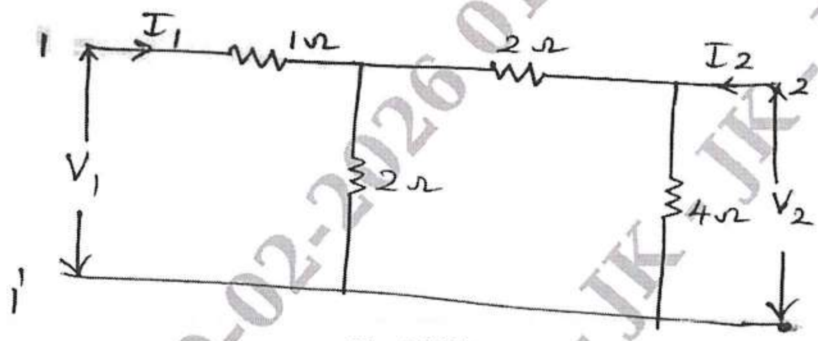


Fig.Q8(b)

Module – 5

Q.9	**a.**	Define Z and Y – parameters. Express Z-parameters in terms of Y.	**10**	**L2**	**CO4**
	b.	Obtain h – parameters for the network shown in Fig.Q9(b).  Fig.Q9(b)	**10**	**L3**	**CO4**
		OR			
Q.10	**a.**	Derive the expressions for Half-power frequencies for a series RLC circuit.	**10**	**L3**	**CO4**
	b.	A series RLC circuit has R = 10 Ω, L = 0.3H and C = 100 μF. The applied voltage is 230 V, find : i. The resonant frequency ii. The quality factor iii. Lower and upper cut-off frequency iv. Bandwidth.	**10**	**L2**	**CO4**

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CBCS SCHEME

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

BEC306A

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Electronic Devices

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 different types of bonding forces in solids.	6	L1	CO1
	b.	Explain with neat diagram, direct and indirect semiconductors.	6	L2	CO1
	c.	Explain the effects of temperature and doping on mobility.	8	L2	CO1
		OR			
Q.2	a.	What is Hall Effect? Explain with suitable diagram and equations how does Hall Effect works?	10	L2	CO1
	b.	Consider a semiconductor bar with W = 0.1 mm, t = 10 μm and L = 5 mm. For B = 10 kg (1 kg = 10^{-5} wb/cm^2) and a current of 1 mA, we have V_{AB} = -2 mV, V_{CD} = 100 mV. Find the type, concentration and mobility of the majority carrier.	6	L3	CO1
	c.	Calculate the conductivity effective mass of electrons in Silicon. (For Silicon, $m_\ell = 0.98 m_o$ and $m_t = 0.19\ m_o$)	4	L3	CO1
		Module – 2			
Q.3	a.	Explain the qualitative description of current flow at p-n junction under equilibrium and biased condition.	10	L2	CO2
	b.	Explain Zener break down and avalanche break down under reverse bias condition.	10	L2	CO2
		OR			
Q.4	a.	A solar cell has a short circuit current of 100 mA and open circuit voltage of 0.8 V under full solar illumination fill factor is 0.7. What maximum power delivered to load by this cell?	4	L3	CO2
	b.	Derive an expression for current and voltage for an illuminated junction of photodiode and discuss the operation in various quadrants in I-V characteristic.	8	L3	CO2
	c.	Explain light emitting diode with a neat sketch.	8	L2	CO2
		Module – 3			
Q.5	a.	Write short notes on : (i) Base narrowing (ii) Avalanche Breakdown in transistor.	10	L2	CO3

	b.	Draw the Ebers-Moll Model for a PNP transistor and explain its significance.	10	L3	CO4
		OR			
Q.6	a.	Explain the process flow for double polysilicon self aligned BJT Fabrication.	10	L3	CO3
	b.	Explain the summary of hole flow and electron flow in p-n-p transistor with proper biasing and list three dominant mechanism which accounts for I_B.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain two-terminal MOS structure using energy band diagram.	10	L2	CO4
	b.	Explain the principle of operation of p-channel enhancement mode MOSFET with neat diagram and equations.	10	L2	CO4
		OR			
Q.8	a.	Explain the construction and operation of n-JFET with neat diagram and equations.	7	L2	CO4
	b.	Explain small signal equivalent circuit of JFET with neat diagram.	7	L2	CO4
	c.	Mention the difference between JFET and MOSFET.	6	L2	CO4
		Module – 5			
Q.9	a.	Explain the evolution of ICs over the years.	10	L1	CO5
	b.	Write the names of the different fabrication steps in a pn junction and explain it.	10	L2	CO5
		OR			
Q.10	a.	Write the structure of a CMOS inverter and show the formation of p-channel and n-channel devices together.	10	L2	CO5
	b.	Draw a neat sketch showing the ion implantation system in the fabrication of a pn junction and explain.	10	L3	CO5

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CBCS SCHEME

USN | | | | | | | | | |

BEC306C

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Computer Organization and 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.	With a neat diagram, describe the functional units of a computer.	8	L2	CO1
	b.	Explain following with an example: i) One address instruction ii) Two address instruction iii) Three address instruction	6	L2	CO1
	c.	Write a short note: i) Basic Performance equation ii) Clock rate	6	L2	CO1
		OR			
Q.2	a.	With a neat diagram, explain basic operational concept of computer.	7	L2	CO1
	b.	With help of example, explain little Endian and Big Endian byte assignment with a neat diagram.	6	L2	CO1
	c.	Explain memory operations.	7	L2	CO1
		Module – 2			
Q.3	a.	Define Assembler Directives. Explain various assembler directives used in Assembly language program.	10	L2	CO2
	b.	Define subroutine and parameter passing. Explain how to pass the parameter by value and by reference.	10	L2	CO2
		OR			
Q.4	a.	Define stack, explain PUSH and POP operations on stack with neat diagram.	10	L2	CO2
	b.	Explain shift and rotate operations with examples.	10	L2	CO2
		Module – 3			
Q.5	a.	Define Interrupt. Explain the various ways of enabling and disabling interrupts.	10	L2	CO3
	b.	Explain DMA technique and its importance.	10	L2	CO3

		OR			
Q.6	**a.**	Explain different ways of handling multiple I/O devices.	**10**	**L2**	**CO3**
	b.	Illustrate interrupt priority scheme with neat diagram.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the principle of working of magnetic disk.	**10**	**L2**	**CO4**
	b.	Explain the internal organization of 1K × 1 dynamic memory chip with neat diagram.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain the interfacing of the main memory to the processor.	**10**	**L2**	**CO4**
	b.	Explain virtual memory organization with a neat diagram.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain single bus organization of the datapath inside a processor with neat diagram.	**10**	**L2**	**CO5**
	b.	Discuss hardwired control unit organization relevant diagram.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain complete processor with neat diagram.	**10**	**L2**	**CO5**
	b.	Develop the complete control sequence for the executing instruction Add $(R_3), R_1$.	**10**	**L2** **L3**	**CO5**

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CBCS SCHEME

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

BEC401

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

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.	Point charges of 50 nC each are located at A (1 , 0, 0), B (-1,0,0) , C (0,1,0) and D (0, -1, 0) in free space. Find the total force on the charge located at A .	08	L3	CO1
	b.	Obtain an expression for electric field intensity at a distant point due to infinite long line charge.	08	L2	CO1
	c.	Define Electric flux density.	04	L2	CO1
		OR			
Q.2	a.	Find the total charge within the volume $0 \le \rho \le 0.1$, $0 \le \phi \le \pi$, $0 \le z \le 4$ If $\rho_v = \rho^2 z^2 \sin(0.6\phi)$	08	L3	CO1
	b.	Given a 60 μC point charge located at the origin, find the total electric flux passing through i) that portion of the sphere r = 26 cm bounded by $0 \le \theta \le \pi/2$ and $0 \le \phi \le \pi/2$ ii) The closed surface defined by ρ = 26 cm and z = ± 26 cm.	08	L3	CO1
	c.	Define surface charge and volume charge density.	04	L1	CO1
		Module – 2			
Q.3	a.	State and prove Divergence theorem.	06	L2	CO2
	b.	Calculate volume charge density ρ_v if $\vec{D} = \frac{10\cos\theta\sin\phi}{r}\vec{a}_r$ c/m^2	08	L3	CO2
	c.	Derive point form of continuity equation.	06	L2	CO2
		OR			
Q.4	a.	State and prove Gauss Law.	05	L2	CO2
	b.	Given the electric field $\vec{E} = 2x\vec{a}_x - 4y\vec{a}_y$ v/m Find the work done in moving a point charge 2c from (2, 0,0) to (0, 0, 0) and then from (0, 0,0) to (0, 2, 0).	07	L3	CO3
	c.	If $\vec{D} = \frac{5r^2}{4}\vec{a}_r$ c/m^2, then evaluate both sides of the divergence theorem for the volume enclosed by r = 4 m, θ = π/4 radians	08	L3	CO3
		Module – 3			
Q.5	a.	Starting from point form of Gauss law deduce Poisson's and Laplace's equation.	06	L2	CO3
	b.	Using Laplace's equation obtain an expression for capacitance of parallel plate capacitor.	08	L3	CO3
	c.	State and explain Ampere's Law.	06	L1	CO3

		OR			
Q.6	**a.**	Derive an expression for magnetic field intensity at a distant point due to infinite long straight conductor using Biot – Savart's law.	**08**	**L2**	**CO3**
	b.	State and explain Stoke's theorem.	**06**	**L1**	**CO3**
	c.	Given $\vec{H} = [y\cos(\alpha x)]\vec{a}_x + (y + e^x)\ \vec{a}_z]$ A/M. Find current density vector over yz plane.	**06**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Derive the expression for force between the differential current elements.	**08**	**L2**	**CO4**
	b.	Obtain Lorentz force equation.	**06**	**L2**	**CO4**
	c.	A conductor 4 m long lies along the y – axis with a current of 10 A in the $\vec{a}_y$ direction. Find the force on the conductor if the field is $\vec{B} = 0.005\ \vec{a}_x$ Tesla.	**06**	**L3**	**CO4**
		OR			
Q.8	**a.**	Define Magnetization and Permeability.	**04**	**L1**	**CO4**
	b.	If $\vec{B} = 0.05 \times \vec{a}_y$ T in a material for which magnetic susceptibility $X_m = 2.5$. Find : i) μ_r ii) μ iii) $\vec{H}$ iv) $\vec{M}$ v) $\vec{J}$	**08**	**L3**	**CO4**
	c.	Discuss the boundary conditions at the interface between two media of different permeabilities.	**08**	**L4**	**CO4**
		Module – 5			
Q.9	**a.**	Write Maxwell's equations in point form and integral form for time varying fields.	**08**	**L2**	**CO5**
	b.	Find the frequency at which conduction current density and displacement current density are equal in a medium with $\sigma = 2 \times 10^4$ ℧ / m and $\epsilon_r = 81$	**06**	**L3**	**CO5**
	c.	Do the fields $\vec{E} = E_m \sin x \sin t\, \vec{a}_y$ and $\vec{H} = \frac{Em}{\mu_0} \cos x \cos t\, \vec{a}_z$ satisfy Maxwell's equation?	**06**	**L3**	**CO5**
		OR			
Q.10	**a.**	Derive a wave equation for a uniform plane wave in free space.	**08**	**L2**	**CO5**
	b.	State and prove poynting theorem.	**08**	**L2**	**CO5**
	c.	The depth of penetration in a certain conducting medium is 0.1 m and frequency of the electromagnetic wave is 1.0 MHz. Find the conductivity of the medium.	**04**	**L3**	**CO5**

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CBCS SCHEME

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

BEC402

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

Principles of Communication 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.	Define the auto correlation and cross correlation. Discuss the properties of auto correlation and cross correlation.	10	L1	CO1
	b.	Define probability with an cxamplc. Discuss thcir propcrtics.	5	L1	CO1
	c.	Develop a problem to generate the probability density function of Gaussian distribution function.	5	L2	CO1
		OR			
2	a.	Determine the characteristic function of a Gaussian random variable with a given mean and variance.	8	L2	CO1
	b.	What is conditional probability? Prove that P(B/A) = P(A/B). P(B)/P(A).	6	L3	CO1
	c.	Define auto covariance, random variable and probability distribution function.	6	L1	CO1
		Module – 2			
3	a.	Derive the expression for Amplitude Modulation (AM) power interms of modulation index.	7	L3	CO2
	b.	Write G Matlab code to generate amplitude modulation and demodulation wave forms and display its spectrum.	8	L3	CO2
	c.	Explain with neat diagrams, AM demodulator using the diode detector.	5	L2	CO2
		OR			
4	a.	An AM transmitter has a carrier power of 30W. The percentage of modulation is 85%. Calculate : i. The total power ii. The power in one sideband.	5	L3	CO3
	b.	Explain a general block diagram of an FDM system.	10	L2	CO3
	c.	Explain amplitude modulation in time domain with necessary waveforms.	5	L2	CO3

		Module – 3			
5	a.	Define PLL, explain with neat diagram of FM demodulator using the IC 565.	10	L2	CO3
	b.	With neat block diagram, explain the concept of frequency modulation with an IC voltage controlled oscillator (ICNE 566).	10	L2	CO3
		OR			
6	a.	Draw the block diagram of a super heterodyne receiver and explain the function of each block.	10	L2	CO3
	b.	Explain with a neat diagram, the frequency spectrum of FM wave.	10	L2	CO3
		Module – 4			
7	a.	What is quantization process? Explain the different types of quantization with their important characteristics.	10	L2	CO4
	b.	For the data stream 110011. Draw the following line code waveforms. i. Unipolar RZ ii. Unipolar NRZ iii. Polar NRZ iv. Bipolar NRZ v. Manchester NRZ.	10	L3	CO4
		OR			
8	a.	Explain the generation and detection of PPM waves with a relevant block diagram.	10	L2	CO4
	b.	What is multiplexing and why it is required in communication? Explain the working of TDM with a neat block diagram.	10	L2	CO4
		Module – 5			
9	a.	Define ISI. Out line base band binary data transmission system with neat block diagram and equations.	10	L2	CO5
	b.	Discuss about Nyquist criterion for distortionless (zero ISI) base band transmission.	10	L2	CO5
		OR			
10	a.	Explain in detail about Internal and External noise.	10	L2	CO5
	b.	Develop a code to generate and plot eye diagram.	6	L2	CO5
	c.	An RF amplifier has an S/N ratio of 8 at the i/p and S/N 6 at the o/p. What are the Noise Ratio and Noise Figure?	4	L3	CO5

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CBCS SCHEME

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BEC405A

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.	Differentiate between microprocessors and microcontrollers.	5	L1	CO1
	b.	With neat diagram explain the architecture of 8051 microcontroller.	10	L2	CO1
	c.	Explain the alternate functions of port-3 in 8051 microcontroller.	5	L2	CO1
		OR			
Q.2	a.	Differentiate between RISC and CISC architectures.	5	L1	CO1
	b.	With suitable interfacing diagram, interface 16 KB of ROM and 32 KB of RAM to 8051 microcontroller. Starting address of ROM is 0000h and of RAM is 8000 h.	10	L3	CO1
	c.	With neat diagram, explain the internal memory organization of 8051 microcontroller.	5	L2	CO1
		Module – 2			
Q.3	a.	What do you mean by addressing mode? Explain any four addressing modes with examples.	8	L2	CO2
	b.	Explain the following instructions with examples: i) DA A ii) XCHD iii) JBC	6	L2	CO2
	c.	Develop an ALP to find smallest number in an array starting at 40 h with five elements. Store the smallest number in the external memory address 5000 h.	6	L4	CO2
		OR			
Q.4	a.	With neat diagram, explain the classification of branch instructions based on the range of their memory access.	8	L2	CO2
	b.	Explain PUSH and POP instructions with the help of neat diagram and examples.	6	L2	CO2
	c.	Develop an ALP to convert a packed BCD number stored in 50 h (internal memory) into two ASCII numbers. Store the result in 30 h and 31 h respectively.	6	L3	CO2

		Module – 3			
Q.5	**a.**	Explain the data types available in 8051 C programming.	**6**	**L2**	**CO3**
	b.	List the steps to program the Timer-0 in mode-2.	**6**	**L1**	**CO3**
	c.	Assume XTAL = 11.0592 MHz, develop an ALP to generate a square wave of 2 kHz frequency on pin P1.5 using Timer-1 in 16-bit mode.	**8**	**L3**	**CO3**
		OR			
Q.6	**a.**	Explain TMOD register with its bit format.	**6**	**L2**	**CO3**
	b.	Develop a 8051 C program to toggle all the bits of Port-0 and Port-2 continuously with 250 ms delay.	**6**	**L3**	**CO3**
	c.	Generate a square wave with an ON time of 3 msec and an OFF time of 10 msec on all pins of Port-0. Show the calculations by assuming XTAL = 22 MHz.	**8**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	List the 8051 microcontroller interrupts with their ROM locations.	**5**	**L1**	**CO4**
	b.	What is the difference between RET and RETI instructions? Explain why we cannot use RET instead of RETI.	**5**	**L2**	**CO4**
	c.	Develop an Assembly Language Program (ALP) to : i) Take data from Port-2 and send it serially and continuously. ii) Generate a square wave at P1.2 using Timer-0 in mode-1, interrupt mode. iii) When INTO is activated, Port-0 is mode 0 for a short time, to switch OFF the LEDs connected to it. The LEDs will also remain OFF if the switch connected to INTO pin (P3.2) is kept pressed.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Explain in detail TCON register with its bit format.	**8**	**L2**	**CO4**
	b.	Assume that after reset, the interrupt priority is set by the instruction "MOV IP, #00001100B". Explain the sequence in which the interrupts are serviced.	**5**	**L2**	**CO4**
	c.	Develop an ALP to generate two square waves: one of 5 kHz frequency at pin P1.3, and another of frequency 25 kHz at pin P2.3. Assume XTAL = 22 MHz.	**7**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	A door sensor is connected to the pin P1.1 pin, and a buzzer is connected to P1.7. Develop an 8051 C program to monitor the door sensor and when it opens, sound the buzzer. Hint : You can send the buzzer by sending a square wave of a few hundred Hz.	**6**	**L3**	**CO5**

	b.	A switch is connected to pin P1.5. Develop a C program to interface DC motor to 8051 and to monitor switch (SW) status to perform the following: i) If SW = 0, the DC motor moves with 50% duty cycle pulse. ii) If DC = 1, the DC motor moves with 25% duty cycle pulse.	6	L3	CO5
	c.	Develop a C program to send the letters 'V', 'T' and 'U' to LCD by interfacing it to the 8051 microcontroller. Also write the interfacing diagram.	8	L3	CO5
		OR			
Q.10	a.	With an interfacing diagram, explain the connections of ADC-0804 to the 8051 microcontroller.	6	L2	CO5
	b.	The switch SW is connected to pin P0.0. Develop a 8051 C program to do the following: i) When SW = 0, the DAC output gives a triangular waveform ii) When SW = 1, the DAC output gives a ramp waveform.	6	L3	CO5
	c.	A switch is connected to pin P2.7. Develop a C program to monitor the status of switch (SW) and perform the following: i) If SW = 0, the stepper motor rotates in clockwise direction. ii) If SW = 1, the stepper motor rotates in counter clockwise direction.	8	L3	CO3

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CBCS SCHEME

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BEC501

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Technological Innovation and Management Entrepreneurship

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 Management. Explain the functions or process of management.	10	L2	CO1
	b.	Explain the various roles of manager.	10	L2	CO1
		OR			
Q.2	a.	List and explain the various steps in planning.	10	L2	CO1
	b.	List and explain the various types of decisions.	10	L2	CO1
		Module – 2			
Q.3	a.	Briefly explain the process of organizing.	10	L2	CO2
	b.	Describe the different steps in the selection procedure.	10	L2	CO2
		OR			
Q.4	a.	Explain Herzberg's TWO-FACTOR-THEORY.	10	L2	CO2
	b.	Discuss the techniques of coordination in detail.	10	L2	CO2
		Module – 3			
Q.5	a.	Illustrate the social responsibilities of business towards different groups.	10	L2	CO3
	b.	Discuss about corporate governance and benefits of good corporate governance.	10	L2	CO3
		OR			
Q.6	a.	What are the characteristics of a successful entrepreneur?	10	L2	CO3
	b.	Illustrate the problems faced by entrepreneurs.	10	L2	CO3
		Module – 4			
Q.7	a.	Discuss role of small scale industries along with Globalization and the WTO on SSI.	10	L2	CO4
	b.	Enumerate and list the external and internal problems faced by small-scale industries.	10	L2	CO4

		OR			
Q.8	**a.**	Discuss how to generate business ideas.	**10**	**L2**	**CO4**
	b.	Explain how to identify a business opportunity in detail.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the following: i) Financial plan ii) Marketing plan	**10**	**L2**	**CO5**
	b.	Discuss why do some business plan fail in detail.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Discuss venture capital meaning in detail.	**5**	**L2**	**CO5**
	b.	Explain importance of network analysis.	**5**	**L2**	**CO5**
	c.	Explain the steps in PERT along with advantages and limitations of PERT.	**10**	**L2**	**CO5**

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CBCS SCHEME

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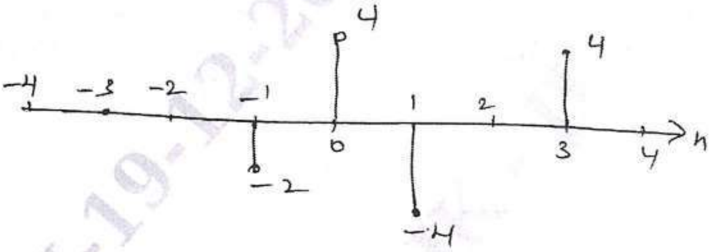
BEC502

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Digital Signal Processing

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.	A discrete time signal x(n) is shown below Fig.Q1(a). Sketch (i) $2x(n-2)$ (ii) $3-x(n)$ (iii) $2x(-n)-4$  Fig.Q1(a)	08	L3	CO1
	b.	Determine whether each of the following signals is periodic or not. If periodic find the fundamental period. (i) $x(n)=\sin(3n)$ (ii) $x(n)=\cos(0.3\pi n+\pi/4)$ (iii) $x(n)=\sin\left(\frac{7\pi n}{37}\right)$	06	L3	CO1
	c.	Write a program to generate the following discrete time signals: (i) Unit sample sequence (ii) Exponential sequence (iii) Random sequence	06	L3	CO1
		OR			
Q.2	a.	The following are the impulse response of discrete time LT1 systems. Determine whether each system is memoryless, causal and stable. (i) $h(n)=e^{-n}\cos(n)*u(n)$ (ii) $h(n)=(0.99)^n*u(n+3)$ (iii) $h(n)=(1/2)^n*u(n)$	09	L3	CO2
	b.	Determine whether the following systems represented by impulse response are causal and stable: (i) $h(n)=5\,\delta(n)$ (ii) $h(n)=(1/4)^{\lvert n\rvert}$ (iii) $h(n)=(1/2)^{-n}u(-n)$	06	L3	CO1
	c.	Write a program to perform the following operation on signals: (i) Signal addition (ii) Signal multiplication (iii) Scaling (iv) Shifting (v) Folding	05	L3	CO1
		Module – 2			
Q.3	a.	Explain the frequency domain sampling of discrete time signals and obtain the DFT and IDFT expressions.	08	L2	CO3
	b.	Find the 4 point DFT of the sequence x(n) = [1, 0, 0, 1] using matrix method and verify the answer by taking the 4-point IDFT of the result.	06	L3	CO3
	c.	Find the 4 point DFT of $x(n)=\cos\frac{\pi n}{4}+\sin\frac{\pi n}{4}$ using linearity property.	06	L3	CO3

		OR			
Q.4	**a.**	Show that the multiplication of two DFT's lead to circular convolution of the corresponding time sequences.	**06**	**L2**	**CO3**
	b.	Consider the finite N sequence $x(n) = \delta(n) + 2\delta(n-5)$ Find (i) The 10 point DFT X(k) (ii) The sequence that has a DFT $Y(k) = e^{\frac{-j4\pi k}{10}} X(k)$ (iii) Find the 10 point sequence y(n) that has DFT Y(k) = X(k)W(k) where X(k) is the 10 point DFT of x(n) and W(k) is the 10 point DFT of $w(n) = u(n) - u(n-7)$.	**06**	**L3**	**CO3**
	c.	Find the circular convolution of sequences $x_1(n) = [1, 2, 3, 1]$ and $x_2(n) = [4, 3, 2, 1]$ using time domain approach and verify the result using frequency domain approach.	**08**	**L3**	**CO3**
		Module – 3			
Q.5	**a.**	State and prove the following properties : (i) Circular time shift of a sequence (ii) Parseval's Theorem	**06**	**L2**	**CO1**
	b.	Find the output y(n) of a filter whose impulse response is h(n) = [1, 1, 1] and the input signal x(n) = [3, –1, 0, 1, 3, 2, 0, 1, 2, 1] using overlap save method. Assume the length of each block N is 5.	**07**	**L3**	**CO3**
	c.	Given x(n) = [1, 2, 3, 4, 4, 3, 2, 1]. Find X(k) using Radix – 2 DIT-FFT Algorithm.	**07**	**L3**	**CO3**
		OR			
Q.6	**a.**	Derive the radix – 2 DIT-FFT algorithm and draw the signal flow graph for N = 8.	**08**	**L2**	**CO3**
	b.	Consider a FIR filter with impulse response h(n) = [3, 2, 1, 1] .If the input is x(n) = [1, 2, 3, 3, 2, 1 , –1, –2, –3, 5, 6, –1, 2, 0, 2, 1] , find the output y(n). Use overlap add method assuming the length of the block is 7.	**07**	**L3**	**CO3**
	c.	A length 8 sequence x(n) = [– 4, 5, 2, –3, 0, –2, 3, 4] with 8-point DFT given ny X(k). Determine the sequence y(n) whose 8-point DFT is given by $Y(k) = W_4^{3k} X(k)$.	**05**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	A low pass filter is to be designed for the desired frequency response $H_d(e^{jw}) = H_d(w) = \begin{cases} e^{-j2w} & \|w\| < \pi/4 \\ 0 & \pi/4 < \|w\| < \pi \end{cases}$ Determine the filter coefficients $h_d(n)$ and h(n) if rectangular window is used. Also find the frequency H(w) of the resulting FIR filter.	**10**	**L3**	**CO4**
	b.	Determine the Direct form realization of the system function $H(z) = 1 + 2z^{-1} - 3z^{-2} + 4z^{-3} + 5z^{-4}$	**04**	**L3**	**CO4**
	c.	Write a program to design digital low pass FIR filter using a window.	**06**	**L3**	**CO4**

		OR			
Q.8	**a.**	Design a FIR filter with desired frequency response $H_d(e^{jw}) = \begin{cases} e^{-j4w} & -\pi/4 \le w \le \pi/4 \\ 0 & \pi/4 \le \lvert w \rvert \le \pi \end{cases}$ Find filter specifications and transfer function using Bartlett window.	**10**	**L3**	**CO4**
	b.	Realize the system function in cascade form $H(z) = 1 + \frac{5}{2}z^{-1} + 2z^{-2} + 2z^{-3}$	**04**	**L3**	**CO4**
	c.	Write a program to design digital high pass FIR filter using a window.	**06**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Design an analog Butterworth lowpass filter that has – 2dB or better (ie., lesser than – 2 dB) at frequency of 20 rad/sec and atleast – 10 dB of attenuation at 30 rad/sec.	**10**	**L3**	**CO5**
	b.	Obtain the direct form – I and direct form – II structure for the filter given by system function $H(z) = \frac{1 + 0.4z^{-1}}{1 - 0.5z^{-1} + 0.06z^{-2}}$	**04**	**L3**	**CO5**
	c.	Write a program to design digital IIR Butterworth low pass filter.	**06**	**L3**	**CO5**
		OR			
Q.10	**a.**	Design a digital Butterworth lowpass filter with frequency specifications given by (i) Passband $\le$ 3.01 dB (ii) Passband edge frequency : 500 Hz (iii) Stopband attenuation $\ge$ 15 dB (iv) Stopband edge frequency : 750 Hz (v) Sampling rate f_s = 2 KHz Use Bilinear transformation metod.	**10**	**L3**	**CO5**
	b.	A filter is given by the difference equation $y(n) - \frac{1}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-2)$ Draw direct form – I and direct form – II realizations.	**04**	**L3**	**CO5**
	c.	Write a program to design digital IIR Butterworth high pass filter.	**06**	**L3**	**CO5**

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CBCS SCHEME

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BEC503

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Digital Communication

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.

<table>
<tr><th colspan="3">Module – 1</th><th>M</th><th>L</th><th>C</th></tr>
<tr><td>Q.1</td><td>a.</td><td>What is Hilbert Transform? Summarize the properties of Hilbert Transform.</td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>Describe with the mathematical expression of canonical representation of Bandpass signals.</td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.2</td><td>a.</td><td>Tabulate the steps used in Gran-Schmidt orthogonalization procedure.</td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>Outline the detector diagram of correlation receiver.</td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td colspan="6">Module – 2</td></tr>
<tr><td>Q.3</td><td>a.</td><td>Derive an expression for probability of error calculation binary PSK using coherent detection.</td><td>10</td><td>L2</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td>Explain with neat diagrams generation and coherent detection of QPSK signals.</td><td>10</td><td>L2</td><td>CO2</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.4</td><td>a.</td><td>Develop signal space diagram of M-array QAM for M = 16.</td><td>10</td><td>L3</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td>Outline the generation and detection of non-coherent DPSK signals with a necessary diagram.</td><td>10</td><td>L2</td><td>CO2</td></tr>
<tr><td colspan="6">Module – 3</td></tr>
<tr><td>Q.5</td><td>a.</td><td>Outline the properties of entropy. Derive an expression for average information content of symbols in long independent sequences.</td><td>10</td><td>L2</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>A source has an alphabet of 7 symbols with probabilities as given below :
<table>
<tr><td>Symbol</td><td>S1</td><td>S2</td><td>S3</td><td>S4</td><td>S5</td><td>S6</td><td>S7</td></tr>
<tr><td>Probability</td><td>1/4</td><td>1/4</td><td>1/8</td><td>1/8</td><td>1/8</td><td>1/16</td><td>1/16</td></tr>
</table>
Construct Huffman binary code and find its efficiency.</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.6</td><td>a.</td><td>Briefly explain the following properties of mutual information
i) Symmetry property
ii) Non negativity property</td><td>10</td><td>L2</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>Derive an expression for Information Capacity Law.</td><td>10</td><td>L2</td><td>CO3</td></tr>
</table>

		Module – 4			
Q.7	**a.**	Consider a (6, 3) linear code whose generator of matrix is $$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$ Calculate : i) All code vectors ii) All the hamming weight and distances iii) Minimum weight parity check matrix iv) Draw the encoder circuit.	**10**	**L3**	**CO4**
	b.	For a systematic (6, 3) linear block code, the parity matrix 'P' is given by $$[P] = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$ Calculate all possible vectors.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	The parity check bits of a (7, 4) Hamming code are generated by $C_5 = d_1 + d_3 + d_4$, $C_6 = d_1 + d_2 + d_3$, $C_7 = d_2 + d_3 + d_4$, where d_1, d_2, d_3 and d_4 are the message bits. i) Compute the generator matrix [G] and parity check matrix [H] for this code ii) Show that $GH^T = 0$.	**10**	**L3**	**CO4**
	b.	Briefly, explain the following terms Hamming weight, Hamming distance and minimum distance of LBC with suitable examples.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Consider the (3, 1, 2) convolutional code with $g^{(1)} = (110)$, $g^{(2)} = (101)$ and $g^{(3)} = (111)$. i) Draw the encoder block diagram ii) Calculate the generator matrix	**10**	**L3**	**CO5**
	b.	Briefly, describe the following terms : i) Code tree ii) Trellis graph iii) State Graph	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Describe the steps of viterbi algorithm in detail.	**10**	**L3**	**CO5**
	b.	Discuss with diagram of the following transconvolutional encoder, generator polynomial of path 1 and path 2.	**10**	**L3**	**CO5**

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CBCS SCHEME

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BEC515D

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Satellite and Optical Communication

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.	Write short note on : 1. Apogee and Perigee distance 2. Umbra and Penumbra region of an eclipse	4	L1	CO1
	b.	Explain three Keplers law of planetary motion.	8	L2	CO1
	c.	Illustrate the concept of Injection velocity and resulting satellite trajectories with neat diagrams and expressions.	8	L2	CO1
		OR			
Q.2	a.	A satellite is moving in an elliptical orbit with the major axis equal to 42000 km. If the perigee distance is 8000 km, find the apogee and the orbit eccentricity.	4	L1	CO1
	b.	Describe different types of satellite orbit with respect to orientation of orbital plane and distance from earth.	8	L2	CO1
	c.	A satellite launched with an injection velocity V_1 from a point above the surface of the earth at a distance P from center of earth attains an elliptical orbit with an apogee distance A_1. The same satellite when launched with an injection velocity V_2 from the same perigee distance attains an elliptical orbit with an apogee distance A_2. Derive the relationship between V_1 and V_2 in terms of P , A_1 and A_2.	8	L2	CO1
		Module – 2			
Q.3	a.	Write short note on satellite subsystem.	5	L1	CO2
	b.	Explain with neat diagrams solar energy driven power system.	7	L2	CO2
	c.	Explain with suitable diagram, monopulse tracking and lobe switching techniques.	8	L2	CO2
		OR			
Q.4	a.	Write short note on Altitude and Orbit control.	5	L1	CO2
	b.	Explain earth station architecture with generalized earth station block diagram.	7	L2	CO2
	c.	Illustrate with neat schematic diagram, Tracking , Telemetry and Command subsystem.	8	L2	CO2

		Module – 3			
Q.5	**a.**	What are Communication related Application of satellites?	**4**	**L1**	**CO3**
	b.	Explain with neat block diagram transparent or bent pipe transponders.	**8**	**L2**	**CO3**
	c.	Describe with neat block diagram Satellite Cable Television.	**8**	**L2**	**CO3**
		OR			
Q.6	**a.**	List out any 5 advantages of satellite over Terrestrial Networks.	**4**	**L1**	**CO3**
	b.	Explain with neat diagrams Direct To Home (DTH) Satellite Television.	**8**	**L2**	**CO3**
	c.	Describe with neat block diagram, basic elements of a Satellite Communication system.	**8**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Consider a multimode step index optical fiber that has a core radius of 25 μm, a core index of 1.48 and an index difference $\Delta = 0.01$. Find the percentage of optical power that propagates in the cladding at 840 nm.	**5**	**L1**	**CO4**
	b.	Describe in detail about different fiber materials.	**7**	**L2**	**CO4**
	c.	Derive the expression for numerical aperture from Ray Theory.	**8**	**L2**	**CO4**
		OR			
Q.8	**a.**	Consider a multimode silica fiber that has a core refractive index $n_1 = 1.480$ and a cladding index $n_2 = 1.460$. Find i) Critical angle ii) the numerical aperture iii) the acceptance angle.	**5**	**L1**	**CO4**
	b.	Explain different types of bending losses.	**7**	**L2**	**CO4**
	c.	Illustrate with necessary diagram Mode theory for circular waveguide.	**8**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the principle of Operation of PIN photodiode.	**10**	**L2**	**CO5**
	b.	Illustrate the concept of diffraction grating with necessary diagram.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain with necessary diagram, the working principle of LASER diodes.	**10**	**L2**	**CO5**
	b.	Discuss about the Operational principles of WDM.	**10**	**L2**	**CO5**

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CBCS SCHEME

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BEC602

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

VLSI Design and Testing

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.	Implement CMOS logic for the following compound gates. i) $F = \overline{A(B+C)+DE}$ ii) $F = \overline{(A+B+C)D}$	10	L3	CO1
	b.	Implement and explain 2 i/p multiplexes using TG and also mention advantages of TG.	10	L3	CO2
		OR			
Q.2	a.	Design flip-flop using multiplexes and inverter.	08	L3	CO2
	b.	Illustrate structural representation for 2 i/p NAND gates by adding performance parameter.	04	L3	CO2
	c.	Develop physical symbolic layout for the following. i) Inverter ii) Transmission Gate	08	L3	CO2
		Module – 2			
Q.3	a.	Explain the working principle of nMOS enhancement nmos transistor.	10	L2	CO1
	b.	Define Body Effect. Illustrate how body effect alters the V_t and give mathematical expressions.	05	L3	CO1
	c.	Discuss β_n / β_p ratio effect on transfer characteristics.	05	L3	CO1
		OR			
Q.4	a.	Draw schematic diagram of CMOS inverter and explain its D C Transfer characteristics.	12	L3	CO1
	b.	Illustrate the mechanism of Latch-up in CMOS and preventive measures.	08	L3	CO1
		Module – 3			
Q.5	a.	Explain czochoalki method for wafer processing.	06	L2	CO1
	b.	Discuss Lamda-based p-well design rules.	06	L2	CO1
	c.	Explain the Twin-tub process.	08	L3	CO1
		OR			
Q.6	a.	Describe switching characteristics of CMOS inverter with equivalent circuits to determine fall and rise time.	10	L3	CO3
	b.	Explain in brief scaling principles of MOS transistor dimensions.	10	L2	CO1
		Module – 4			
Q.7	a.	What are the advantages of Dynamic CMOS logic and explain the working of dynamic CMOS inverter with timing diagrams.	08	L3	CO4
	b.	Realize 2 inputs XOR / XNOR gate using cascode voltage switch logic.	04	L3	CO4
	c.	Implement 4 – way switch logic using Transmission gate and write layout version of CMOS logic.	08	L3	CO4

		OR			
Q.8	**a.**	Draw star connection for CMOS inverter layout optimization and mention its advantages.	**06**	**L3**	**CO4**
	b.	Find Euler's path for the function $Z=\overline{(A+B)+CD}$ and draw corresponding layout.	**06**	**L3**	**CO4**
	c.	Write short notes on : i) ESD Protection ii) Tristate and Bidirectional Pads.	**08**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Implement AOI based clocked NOR SR Latch circuit with waveforms.	**10**	**L3**	**CO5**
	b.	Illustrate typical design flow of a contemporary and an ideal approach for designing system.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Illustrate J – K flip – flop with Nand gate JK latches with waveforms.	**10**	**L3**	**CO5**
	b.	Write short notes on : i) Adhoc Testing ii) Self Test and Build in Test.	**10**	**L2**	**CO1**

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CBCS SCHEME

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

Microwave Engineering and Antenna Theory

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 clearly how GUNN diode is being a negative resistance device.	6	L2	CO1
	b.	A certain transmission line has the characteristics impedance of $(75 + j0.01)\ \Omega$ and is terminated in load impedance of $(70 + j50)\Omega$. Compute : i. The reflection coefficient ii. Transmission coefficient.	6	L3	CO1
	c.	Derive the equation of transmission line to find voltage and current on the line.	8	L3	CO1
		OR			
2	a.	A transmission line is terminated in a resistive load of $1000\ \Omega$ and has $L = 9\mu H/m$ and $C = 100\ pF/m$. Calculate reflection co-efficient and standing wave ratio.	6	L3	CO1
	b.	Define reflection coefficient. Derive an expression for reflection co-efficient at load in terms of characteristic impedance and load impedance.	8	L3	CO1
	c.	Explain Microwave System with relevant diagram.	6	L2	CO1
		Module – 2			
3	a.	Deduce the relation between incident and reflected waves in terms of S-parameters for a two port network.	6	L3	CO2
	b.	Derive an expression for input reflection co-efficient for two port network with mismatched load.	10	L3	CO2
	c.	Write a note on different losses in microwave network.	4	L4	CO2
		OR			
4	a.	Explain the following with necessary sketches : i. Flexible co-axial cable ii. Movable vane attenuator.	10	L2	CO2
	b.	Explain magic tee and write its S-Matrix representation.	10	L2	CO2

		Module – 3			
5	a.	Explain parallel strip line with relevant diagram.	6	L2	CO3
	b.	A lossless parallel strip line has a conducting strip of width 'W'. The substrate dielectric separating the 2 conducting strips has a relative dielectric constant ε_{rd} of 6 and a thickness 'd' of 4mm. Calculate : i. Value of W so that $Z_0 = 50\Omega$ ii. Strip line capacitance iii. Strip line inductance iv. Phase velocity.	10	L3	CO3
	c.	Explain the following terms related to antenna systems : i. Directivity ii. Power Density.	4	L2	CO4
		OR			
6	a.	Explain antenna radiation pattern. Prove that maximum effective aperture of short electric dipole is $0.119\lambda^2$.	10	L3	CO4
	b.	State and prove Frii's Transmission formula.	6	L2	CO4
	c.	Explain the construction and field pattern of micro strip line.	4	L2	CO3
		Module – 4			
7	a.	Derive the expression for radiation resistance of short electric dipole antenna.	10	L3	CO4
	b.	Obtain the expression for total electric field for array of n-point sources consider uniform linear array.	10	L2	CO4
		OR			
8	a.	Explain principle of pattern multiplication.	6	L2	CO4
	b.	Write a note on Thin Linear Antenna.	8	L1	CO4
	c.	A thin dipole antenna is $\lambda/10$ long. If its loss resistance is 2.5Ω. Find the radiation resistance and efficiency.	6	L3	CO4
		Module – 5			
9	a.	Explain different types of horn antenna with relevant diagrams.	10	L2	CO5
	b.	The radius of a circular loop antenna is 0.02λ. How many turns of the antenna will give radiation resistance of 35Ω?	6	L3	CO5
	c.	Compare the far field components of small loop and short dipole antenna.	4	L1	CO5
		OR			
10	a.	Explain Yagi-Uda antenna and list its applications.	10	L2	CO5
	b.	Explain Parabolic dish antenna or microwave dish antenna with relevant diagram.	10	L2	CO5

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CBCS SCHEME

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BEC/BTE702

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

Computer Networks and Protocols

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 types of physical topologies available in computer networks.	10	L2	CO1
	b.	With a neat diagram, explain the significance of layers in TCP/IP protocol suite.	10	L2	CO2
		OR			
Q.2	a.	Explain LAN and WAN with the help of neat diagrams.	10	L2	CO1
	b.	What is an ARP? Explain the operation of ARP and its packet format with suitable diagrams.	10	L2	CO2
		Module – 2			
Q.3	a.	Explain CSMA and show the behavior of the three persistence methods of CSMA.	10	L2	CO2
	b.	Describe flow control and error control in Data link layer.	5	L2	CO2
	c.	Write a 'C' program to perform Bit stuffing.	5	L2	CO3
		OR			
Q.4	a.	Explain CSMA/CA protocol with a flow diagram.	10	L2	CO2
	b.	Explain the Ethernet frame format of standard Ethernet.	5	L2	CO2
	c.	Write a 'C' program to perform Byte stuffing.	5	L2	CO3
		Module – 3			
Q.5	a.	Explain the working of Dynamic Host Configuration Protocol [DHCP].	10	L2	CO3
	b.	With a neat diagram, explain the virtual circuit packet network and its various phases of operation.	10	L2	CO3
		OR			
Q.6	a.	Explain IPv4 Datagram format, with a neat diagram.	10	L2	CO3
	b.	Explain distance vector routing and write a 'C' program to perform distance vector routing.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain connectionless and connection oriented protocols in transport layer.	10	L2	CO2
	b.	Explain the working of Go-back-N protocol.	10	L2	CO2
		OR			
Q.8	a.	With a neat diagram, explain state transition diagram of TCP.	10	L2	CO2
	b.	Explain UDP services along with neat diagram of Pseudo header for checksum.	10	L2	CO2
		Module – 5			
Q.9	a.	Explain the following with diagram : i) WWW iii) HTTP iii) FTP.	10	L2	CO4
	b.	Explain the architecture of electronic mail with a neat diagram.	10	L2	CO4
		OR			
Q.10	a.	Explain DNS Name space, DNS in the internet and resolution.	10	L2	CO4
	b.	Explain remote logging in TELNET with a neat diagram.	10	L2	CO4

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CBCS SCHEME

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BEC703

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Wireless Communication 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.	Derive an Expression for Rayleigh Fading Wireless Channel.	10	L2	CO2
	b.	In the wireless Rayleigh fading channel consider a transmit power Pt (dB) = 20 dB. What is the probability that the power at the receiver is greater than Pr(dB) = 10 dB?	10	L2	CO1
		OR			
Q.2	a.	Explain the modeling of wireless systems with proper equations.	10	L2	CO1
	b.	Give the mathematical equations for RMS Delay Based on Average Power Profile.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the Properties of PN sequences.	10	L2	CO1
	b.	Explain any two advantages of CDMA.	10	L2	CO1
		OR			
Q.4	a.	Illustrate OFDM with an example.	10	L2	CO1
	b.	With neat schematic explain MIMO-OFDM Transmitter.	10	L2	CO1
		Module – 3			
Q.5	a.	Explain GSM Network Architecture.	10	L2	CO1
	b.	Explain IP-Based Flat Network Architecture.	10	L2	CO1
		OR			
Q.6	a.	Explain Multi Antenna techniques.	10	L2	CO1
	b.	Explain LTE Network Architecture with necessary diagram.	10	L2	CO1
		Module – 4			
Q.7	a.	Explain MIMO System Model.	10	L2	CO1
	b.	Derive Expression for MIMO Zero-Forcing (ZF) Receiver.	10	L2	CO1

		OR			
Q.8	**a.**	Compute the MIMO zero-forcing receiver for the channel matrix H given $H = \begin{bmatrix} 2 & 3 \\ 1 & 3 \\ 1 & 2 \end{bmatrix}$	**10**	**L3**	**CO2**
	b.	Derive expression for MIMO MMSE Receiver.	**10**	**L2**	**CO1**
		Module – 5			
Q.9	**a.**	With neat diagram, explain design principles of LTE Network.	**10**	**L2**	**CO1**
	b.	Explain the Hierarchical Channel Structure of LTE.	**10**	**L2**	**CO1**
		OR			
Q.10	**a.**	Explain the time domain frame structures of OFDM.	**10**	**L2**	**CO1**
	b.	Explain Uplink SC-FDMA Radio Resources.	**10**	**L2**	**CO1**

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CBCS SCHEME

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BEC714B/BTE714B

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

Computer & 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.	Define the need for computer security. Explain the principles of security.	5	L1	CO1
	b.	Explain different types of attacks with examples.	5	L2	CO1
	c.	Describe a model for Network Security and its components.	10	L2	CO1
		OR			
Q.2	a.	Describe security approaches and security services.	5	L1	CO1
	b.	Explain how attacks are categorized in terms of passive and active attacks.	5	L2	CO1
	c.	Illustrate a network security model with a diagram and explanation.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the characteristics of Trojan horses, viruses and worms.	6	L1	CO2
	b.	Describe defenses against malicious logic.	6	L2	CO2
	c.	Explain penetration studies and Vulnerability classification.	8	L2	CO2
		OR			
Q.4	a.	Define Malicious logic and its types.	6	L1	CO2
	b.	Expalin Vulnerability analysis framework with examples.	6	L2	CO2
	c.	Discuss how penetration testing helps identify vulnerabilities in system.	8	L2	CO2
		Module – 3			
Q.5	a.	Define Auditing. Explain anatomy of an auditing system.	6	L1	CO2
	b.	Describe designing an auditing system and a posteriori design.	6	L2	CO3
	c.	Explain intrusion detection models and architecture of IDS.	8	L3	CO3
		OR			
Q.6	a.	Explain Auditing Mechanisms with examples.	6	L1	CO3
	b.	Discuss intrusion response techniques in Network Security.	6	L2	CO3
	c.	Illustrate organization of an intrusion detection system with a diagram.	8	L3	CO3
		Module – 4			
Q.7	a.	Explain Network Security Policies and Development.	6	L1	CO4
	b.	Discuss Network Flooding and measures to anticipate attacks.	6	L2	CO4
	c.	Describe system security policies for networks, users and files.	8	L2	CO4
		OR			
Q.8	a.	Describe availability issues in Network Security.	6	L1	CO4
	b.	Explain authentication mechanisms in system security.	6	L2	CO4
	c.	Illustrate retrospective security techniques for files and processes.	8	L2	CO4
		Module – 5			
Q.9	a.	Explain user security policies for access, files and processes.	6	L1	CO4
	b.	Discuss electronic communications security for users.	6	L2	CO4
	c.	Describe program security design, refinement and implementation.	8	L2	CO4
		OR			
Q.10	a.	Explain user access control policies with examples.	6	L1	CO4
	b.	Describe program security requirements and policy.	6	L2	CO4
	c.	Illustrate secure program design with refinements and implementation steps.	8	L3	CO4

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CBCS SCHEME

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BEC755D/BTE755D

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Sensors and Actuators

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 a transducer. Give the classification of transducers with suitable examples.	10	L2	CO1
	b.	Explain the necessity of transducers. List out the advantages and disadvantages of electrical transducers.	10	L2	CO1
		OR			
Q.2	a.	With a neat diagram, explain the generalized measurement system and describe it's functional elements.	10	L2	CO1
	b.	Briefly explain the different modes of measurement with an example.	05	L2	CO1
	c.	Discuss the applications of measurement systems.	05	L2	CO1
		Module – 2			
Q.3	a.	Discuss the instruments in terms of static characteristics of, (i) Accuracy (ii) Errors and Correction	6	L2	CO2
	b.	A pressure indicator showed a reading as 42 bar on a scale range of 0.50 bar, if the true value was 41.4 bar determine, (i) Static error (ii) Static correction (iii) Relative-Static correction.	6	L3	CO2
	c.	Explain the following terms : (i) Scale readability (ii) Repeatability (iii) Reproducibility (iv) Static Calibration	8	L2	CO2
		OR			
Q.4	a.	Explain the following terms : (i) Hysteresis (ii) Dead zone (iii) Dead time (iv) Loading effects (v) Noise	10	L2	CO2
	b.	Describe Zero, First and Second order systems with suitable examples.	10	L2	CO2

		Module – 3			
Q.5	**a.**	Briefly explain Thermistors and Resistance thermometer, with an example.	**10**	**L2**	**CO3**
	b.	Explain with neat diagram, (i) Thermocouple (ii) Thermo electric pyrometer	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Explain briefly the LVDT with a neat diagram.	**10**	**L2**	**CO3**
	b.	With a neat diagram, explain the working of capacitive transducer.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Define Load Cell and explain the working of a Strain Gauge Load cell.	**10**	**L2**	**CO4**
	b.	Explain the working of Semi-conductor strain gauge with advantages.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Briefly explain working of a Wheat-Stone Bridge circuit (Null mode).	**10**	**L2**	**CO4**
	b.	Explain the working of a Hydraulic Load cell.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Define signal conditioning. Explain the various functions of signal conditioning circuits.	**10**	**L2**	**CO5**
	b.	Explain briefly the following : (i) Successive approximation A/D converter. (ii) Flash A/D converter.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Define DAS. Explain generalized DAS with a neat block diagram.	**10**	**L2**	**CO5**
	b.	Explain briefly the following amplifiers: (i) Mechanical amplifier. (ii) Electrical and Electronic amplifiers.	**10**	**L2**	**CO5**

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