AJ Institute of Engineering and Technology
Mangaluru.

VTU Question Papers

Electronic & Communication Engineering
Make-Up Exam

III to VIII Semester

2022 SCHEME

LIBRARY & INFORMATION CENTER

AJ Institute of Engineering and Technology, Mangaluru.

NH-66, Kottara Chowki, Mangaluru – 575 006

INDEX

CBCS SCHEME - Make-Up Exam

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.	Define combinational logic circuit. Explain design procedure of combinational circuit.	6	L1	CO1
	b.	Covert $x = \bar{a}b + bc$ to canonical form.	4	L1	CO1
	c.	Find all prime implicants of using Quin-McClusky method and simplify it $Z = f(a,b,c,d) = \Sigma m(1,2,3,5,9,12,14,15) + \Sigma d(4,8,11)$.	10	L1	CO1
		OR			
Q.2	a.	Define literals and solve the following equation using canonical form : i) $P = f(a,b,c) = a\bar{b} + a\bar{c} + bc$ ii) $Q = f(a,b,c) = (a + \bar{b})(\bar{b} + c)$ iii) $R = f(a,b,c) = A + ABC$.	10	L1	CO1
	b.	Simplify the following expression using K-map. Implement the simplified expression using basic gates only. i) $F(a,b,c,d) = \Sigma m(1,3,7,11,15) + \Sigma d(0,2,4)$ ii) $F(a,b,c,d) = \pi M(0,4,8,12,13,14,15)$.	10	L1	CO1
		Module – 2			
Q.3	a.	Draw the block diagram of 4-bit look ahead carry adder. Derive the expressions for the carry outputs using propagate and generate inputs.	10	L2	CO2
	b.	Implement full adder and full subtractor using 74138 decoder.	10	L2	CO2
		OR			
Q.4	a.	Design 2-bit comparator using gates.	10	L3	CO2
	b.	Implement following two outputs function using 74LS138 and external gates : $F_1(A,B,C) = \Sigma m(1,4,5,7)$ $F_2(A,B,C) = \pi m(2,3,6,7)$.	5	L3	CO2
	c.	Implement following Boolean function using 8 : 1 MUX. $F(P,Q,R,S) = \Sigma m(0,1,3,4,8,9,15)$.	5	L3	CO2

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

		Module – 3			
Q.5	**a.**	Define sequential circuit. Explain the operation of a switch debouncer using S-R Latch with help of circuits and waveform.	**10**	**L1**	**CO3**
	b.	Explain the working of master-slave JK flip-flop with functional table and timing diagram.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Find characteristics equation for SR, JK, D and T flip-flop with the help of function table.	**10**	**L1**	**CO3**
	b.	Construct mod – 6 synchronous counter using JK flip-flop.	**10**	**L4**	**CO3**
		Module – 4			
Q.7	**a.**	Define HDL. List all data types in verilog HDL. Explain any two data types.	**10**	**L1**	**CO4**
	b.	Explain the various types of logical operators with an example.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain classification of types of description with an example.	**10**	**L2**	**CO4**
	b.	i) Write verilog code for full adder ii) Write verilog code for 8 : 1 MUX.	**10**	**L1**	**CO4**
		Module – 5			
Q.9	**a.**	Write a verilogy structure code for four bit ripple carry adder.	**10**	**L1**	**CO4**
	b.	Explain structure of behavioural description with example.	**10**	**L2**	**CO4**
		OR			
Q.10	**a.**	Write a verilog behavioural code for 4 to 1 MUX using case statement.	**10**	**L1**	**CO4**
	b.	Explain with block diagram the components of a verilogy module by highlighting mandatory blocks.	**10**	**L2**	**CO4**

* * * * *

VTU-10-10-2025 08:19:43am - JK - JK - JK - JK
10-10-2025 09:01:09am - JK - JK - JK - JK
A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

CBCS SCHEME - Make-Up Exam

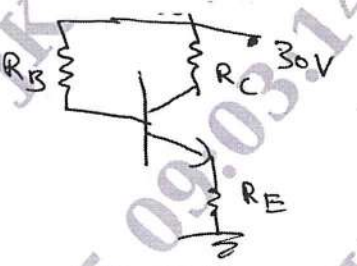
USN | | | | | | | | | | |

BEC303

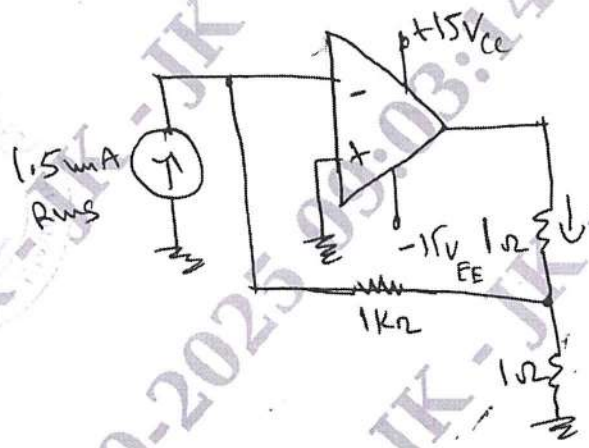
Third Semester B.E/B.Tech. Degree Examination, June/July 2025
Electronic Principles and Circuits

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
1	a.	Explain the Simplified Analysis of voltage divider biasing.	10	L3	CO1
	b.	For a CC Amplifier obtain r_e, Av, $Z_{in(base)}$, $Z_{in(stage)}$.	10	L3	CO1
		OR			
2	a.	Explain the importance of both T model and π model with necessary equations.	6	L2	CO1
	b.	What are H parameters? Mention the relationship between R and H parameters.	6	L2	CO1
	c.	For the emitter circuit shown in Fig. Q2 (c). Find the values of R_C, R_E and R_B using following specifications $I_{C(sat)} = 10$ mA, $I_{CQ} = \frac{1}{2} I_{C(sat)}$, $V_C = 20$ V, $\beta = 100$.  Fig. Q2 (c)	8	L5	CO1
		Module – 2			
3	a.	Explain the fixing of V_G and connecting source resistance in MOSFET circuits.	8	L1 L2	CO2
	b.	Explain the CS amplifier with source resistance.	8	L1 L2	CO2
	c.	Write a note on Transconductance g_m.	4	L1 L2	CO2
		OR			
4	a.	Obtain the voltage gain of small signal MOSFET amplifier and write the small signal equivalent models with necessary equations (MOSFET).	10	L3 L4 L5	CO2
	b.	Determine the input resistance, voltage gain and output resistance of common source (CS) amplifier with neat circuit diagram and small signal model.	10	L3 L4 L5	CO2

A.J. Institute of Engineering & Technology LIBRARY Mangaluru

		Module – 3			
5	a.	Design 4 bit R-2R Ladder D/A converter.	**10**	**L3 L4**	**CO3**
	b.	Explain the working of Wien Bridge oscillator with neat Lag, Lead circuits and oscillator circuit.	**10**	**L2 L4**	**CO3**
		OR			
6	a.	Design and explain the working of Monostable multivibrator for the pulse width 0.5 msec with neat circuit diagram and waveforms.	**10**	**L3 L4**	**CO3**
	b.	Explain the working of Schmitt Trigger and its Hysteresis response when it is in Inverting mode.	**10**	**L2 L4**	**CO3**
		Module – 4			
7	a.	Briefly explain the four basic feedback topologies with neat necessary block diagrams.	**8**	**L1 L2**	**CO4**
	b.	Design an Active high pass filter when the lower cut off frequency in 2 kHz. With neat circuit diagram and frequency response (*second order). Assume gain = 1.586	**8**	**L2 L4**	**CO4**
	c.	Explain the VCIS Amplifier with circuit diagram and equations.	**4**	**L1 L2**	**CO4**
		OR			
8	a.	What is a filter? Design an Active first order Low pass filter when cut off frequency is 5 kHz.	**6**	**L2 L4**	**CO4**
	b.	For an ICIS amplifier as shown below. Calculate current gain, load current and load power.  Fig. Q8 (b)	**6**	**L4 L5**	**CO4**
	c.	Explain the Baud Stop filter with neat circuit diagram and equations. Write the practical and theoretical frequency responses. (second order notch filter)	**8**	**L2 L4**	**CO4**
		Module – 5			
9	a.	Explain Class A operation with neat circuit diagram, obtain power gain, output power, Transistor power dissipation and efficiency equations.	**10**	**L2 L3**	**CO5**
	b.	Write a note on the Schockey diode.	**5**	**L1 L2**	**CO5**
	c.	Explain the concept of push pull operation with neat circuit diagram. Also mention advantages and disadvantages.	**5**	**L1 L2**	**CO5**

		OR			
10	a.	With neat circuit diagram, explain the operation of Class B push pull Emitter follower along with AC and DC analysis.	8	L1 L2	CO5
	b.	Explain SCR phase control.	6	L1 L2	CO5
	c.	Write a note on Diac and Triac.	6	L1 L2	CO5

* * * * *

VTU-14-10-2025 08:46:43am - JK - JK - JK - JK - JK
JK - JK - JK - JK - JK - JK - JK - JK
14-10-2025 09:03:14am - JK - JK - JK - JK - JK
A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

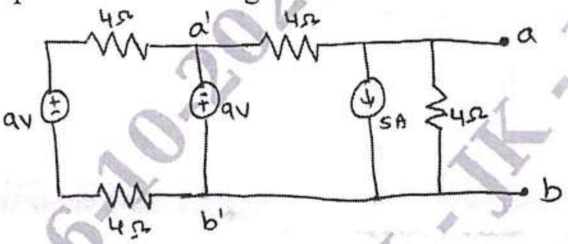
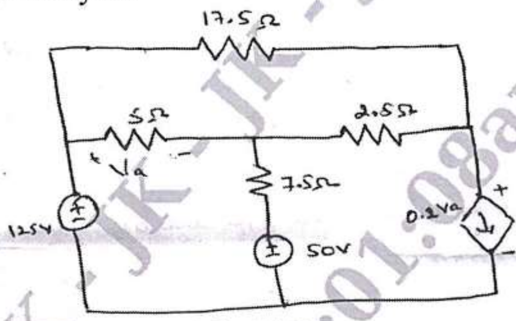
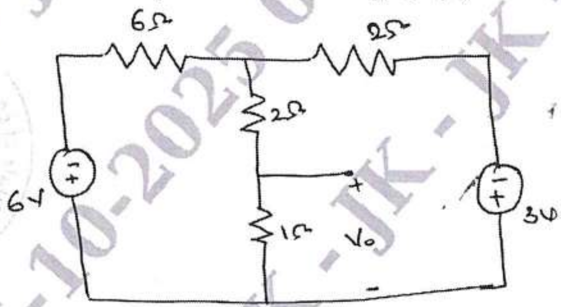
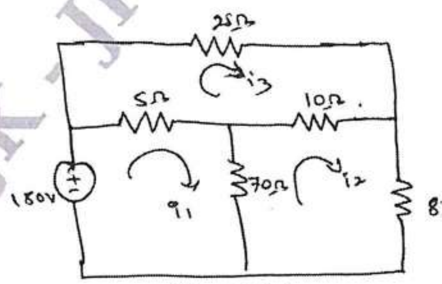
USN | | | | | | | | | | |

BEC304

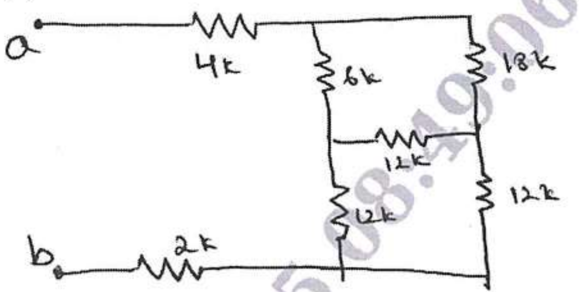
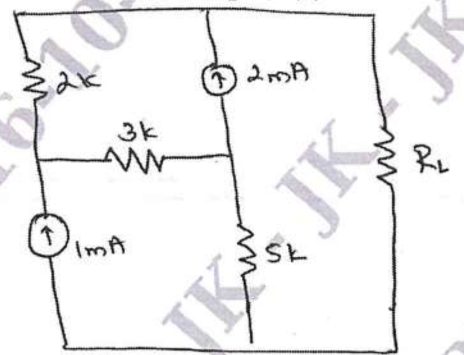
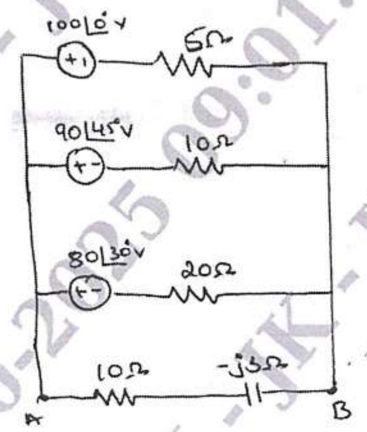
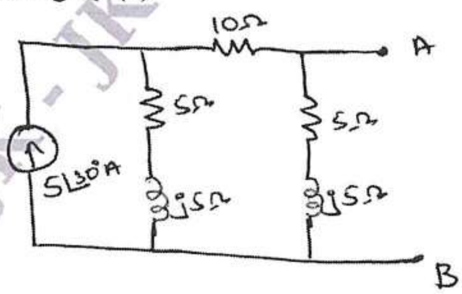
Third Semester B.E./B.Tech. Degree Examination, June/July 2025
Network Analysis

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.	Use source transformation to convert the circuit in Fig.Q1(a) to a single current source in parallel with a single resistor.  Fig.Q1(a)	05	L2 L3	CO1
	b.	Find the currents in various branches in the circuit shown in Fig.Q1(b) using mesh current analysis.  Fig.Q1(b)	10	L2 L3	CO1
	c.	Use nodal analysis to find V_0 in the circuit Fig.Q1(c).  Fig.Q1(c)	05	L2 L3	CO1
		OR			
Q.2	a.	Refer the circuit shown in Fig.Q2(a). Find the power dissipated in the 70 Ω register.  Fig.Q2(a)	10	L2 L3	CO1

VTU 16-10-2025 08:49:06am - JK - JK - JK
A.J. Institute of Engineering & Technology LIBRARY Mangaluru

<table>
<tr><td></td><td>b.</td><td>Find the value of resistance between the terminals a – b of the network shown in Fig.Q2(b).
 
Fig.Q2(b)</td><td>10</td><td>L2
L3</td><td>CO1</td></tr>
<tr><td colspan="6">Module – 2</td></tr>
<tr><td>Q.3</td><td>a.</td><td>Find the R_L for maximum power transfer and maximum power that can be transferred in the network shown in Fig.Q3(a).
 
Fig.Q3(a)</td><td>10</td><td>L2
L3</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td>Find the current through (10 – j3)Ω using Millman's theorem. [Refer Fig.Q3(b)]
 
Fig.Q3(b)</td><td>10</td><td>L2
L3</td><td>CO2</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.4</td><td>a.</td><td>Obtain Thevenin's and Norton's equivalent circuit at the terminals AB for the network shown in Fig.Q4(a).
 
Fig.Q4(a)</td><td>10</td><td>L2
L3</td><td>CO2</td></tr>
</table>

VTU-16-10-2025 09:01:08am - JK - JK - JK
J.T. Institute of Engineering & Technology LIBRARY Mangaluru-575006

Q. No.		Question	Marks	Level	CO
	b.	Find the value of R_L in the network shown in Fig.Q4(b) that will achieve max power transfer and determine the value of the maximum power.	10	L2 L3	CO2

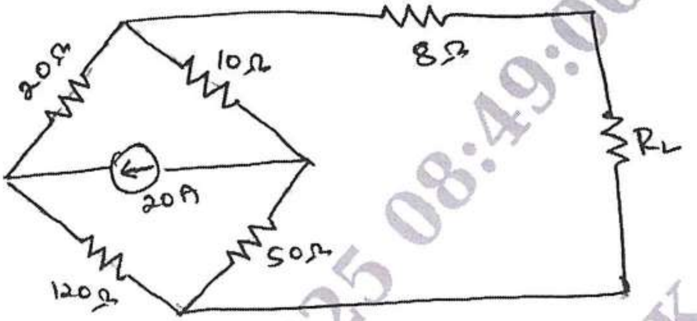


Fig.Q4(b)

Module – 3

Q. No.		Question	Marks	Level	CO
Q.5	a.	In the network of Fig.Q5(a) the switch is moved from position (1) to position (2) at t = 0. The steady state having reached before switching. Calculate i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$	10	L2 L3	CO2

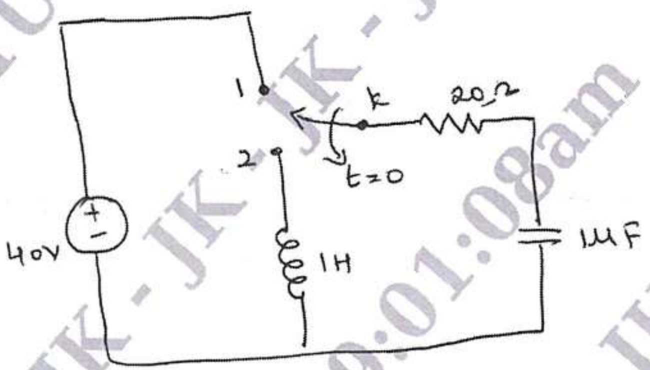


Fig.Q5(a)

Q. No.		Question	Marks	Level	CO
	b.	For the circuit shown in Fig.Q5(b) steady state is reached with switch K open. At t = 0, the switch is closed. Determine the values of $V_a(0^-)$ and $V_a(0^+)$.	10	L2 L3	CO2

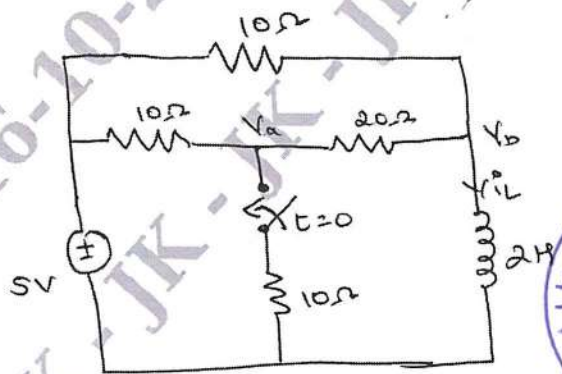
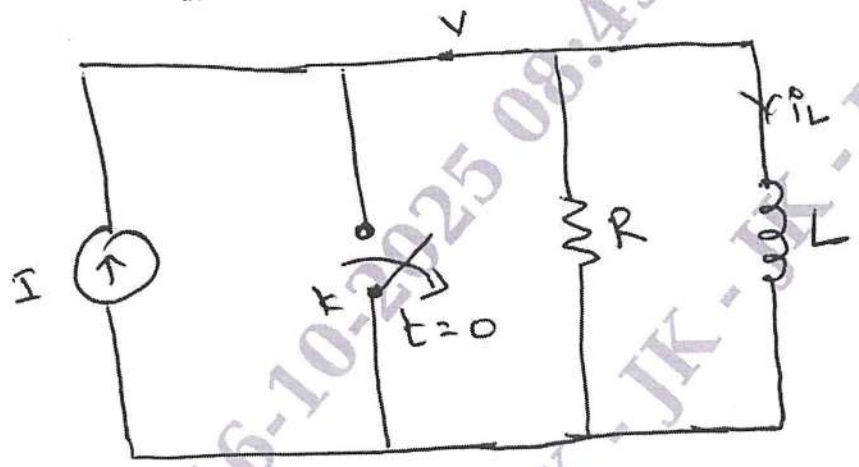
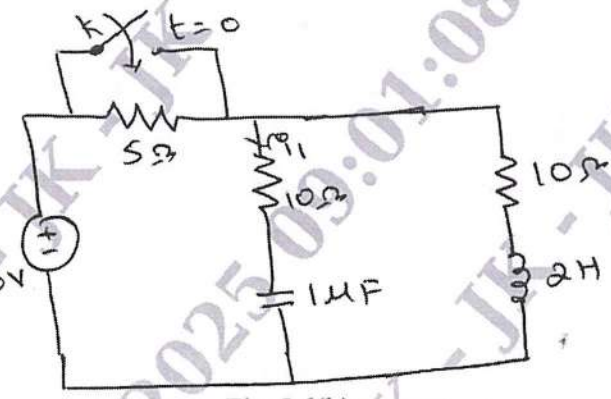


Fig.Q5(b)

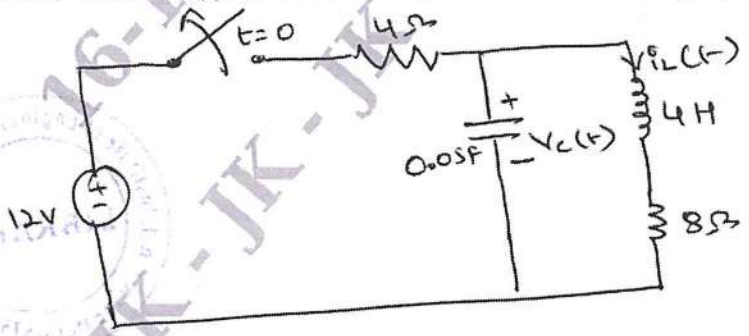
A.J. Institute of Engineering & Technology
LIBRARY
Mangaluru-575006

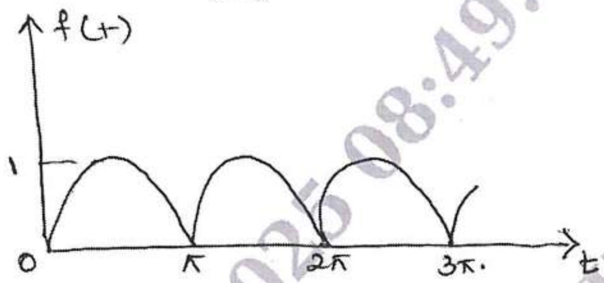
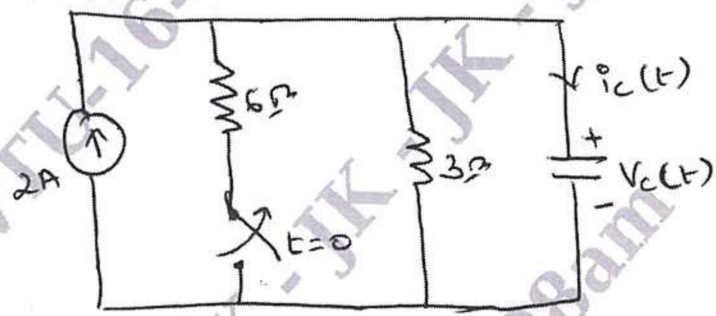
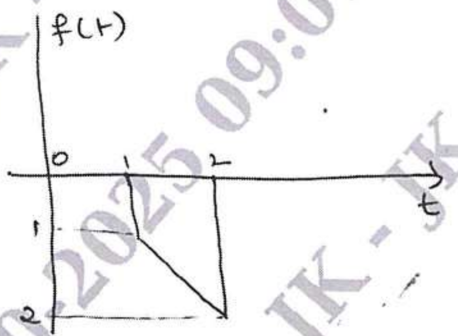
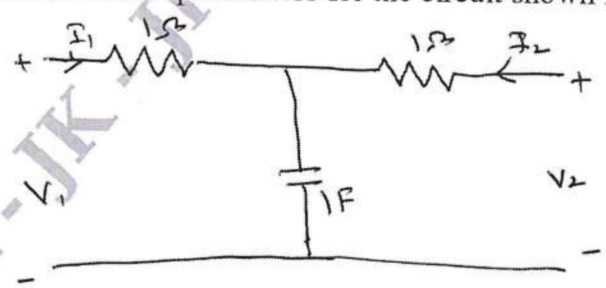
VTU 16-10-2025 08:49:06am JK - JK - JK
16-10-2025 09:01:08am JK - JK - JK

OR

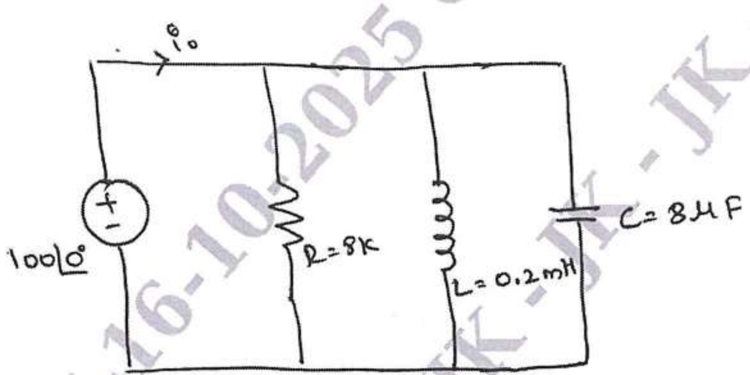
Q.6	**a.**	In the given network Fig.Q6(a), the switch K is opened at $t = 0^+$, solve for the values of V, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ if I = 2A, R = 200 Ω and L = 1 H.  Fig.Q6(a)	**10**	**L2 L3**	**CO2**
	b.	In the circuit shown in Fig.Q6(b) steady state is reached with switch K open, the switch is closed at t = 0. Determine i_1 , i_2 , $\frac{di_1}{dt}$ and $\frac{di_2}{dt}$ at $t = 0^+$.  Fig.Q6(b)	**10**	**L2 L3**	**CO2**

Module – 4

Q.7	**a.**	Determine the current $i_L(t)$ for $t \geq 0$ for the circuit shown in Fig.Q7(a).  Fig.Q7(a)	**10**	**L2 L3**	**CO3**

	b.	Refer the waveform shown in Fig.Q7(b). The equation for the waveform is sin t from 0 to π, – sin t from π to 2π. Show the Laplace transform of this waveform is $F(s) = \frac{1}{s^2+1}\coth\left(\frac{\pi s}{2}\right)$  Fig.Q7(b)	10	L2 L3	CO3
		OR			
Q.8	a.	Determine the voltage $V_c(t)$ and the current $i_c(t)$ for $t \geq 0$ for the circuit shown in Fig.Q8(a).  Fig.Q8(a)	10	L2 L3	CO3
	b.	Express the function shown in Fig.Q8(b) using singularity function and then find F(s).  Fig.Q8(b)	10	L2 L3	CO3
		Module – 5			
Q.9	a.	Obtain Y parameters in terms of Z parameters and h-parameters.	10	L2 L3	CO4
	b.	Determine the transmission parameters for the circuit shown in Fig.Q9(b).  Fig.Q9(b)	10	L2 L3	CO4

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575 006

		OR			
Q.10	a.	Derive an expression of Bandwidth, half power frequencies and quality factor of a series resonance circuit.	10	L1 L2	CO5
	b.	For the circuit shown in Fig.Q10(b) find the following : i) ω_0, Q, B ii) ω_1 and ω_2 iii) The max power dissipated at ω_0, ωc_1 and ωc_2 (resonate freq and cutoff freq.)  Fig.Q10(b)	10	L2 L3	CO5

* * * * *

VTU-16-10-2025 08:43:06am - JK - JK - JK - JK
16-10-2025 09:01:08am - JK - JK - JK - JK - JK
A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

CBCS SCHEME - Make-Up Exam

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

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 three different types of bonding forces in solids.	7	L2	CO1
	b.	With a neat energy band diagram, explain direct and indirect semiconductors and its uses.	7	L2	CO1
	c.	Sketch and explain the energy band model for extrinsic semiconductor materials at room temp, and 50°K temperature.	6	L3	CO1
		OR			
Q.2	a.	Derive the expression of conductivity, mobility and current density for an applied electric field.	8	L3	CO1
	b.	Analyze, the effects of temperature and doping on mobility for various semicondcutors.	6	L4	CO1
	c.	Consider a semiconductor bar with W = 0.1 mm, t = 10 μm and L = 5 mm. For B = 10 KG, (1KG = 10^{-5} Wb/cm^2) and a current of 1 mA, we have V_{AB} = -2mV and V_{CD} = 100 mV. Find the type concentration and mobility of the majority carrier.	6	L3	CO1
		Module – 2			
Q.3	a.	Explain the process of electron tunneling from n-side into p-side in a Zener breakdown p-n junction diode.	6	L2	CO2
	b.	List the various requirements for a good rectifier junction diode. also analyse the effect of doping concentration on rectifier operation.	6	L1,2	CO2
	c.	Explain the Qualitative description of current flow at p-n junction.	8	L3	CO2
		OR			
Q.4	a.	Discuss the device structure, I-V characteristics and figure of merit for the illuminated solar cell.	8	L3	CO2
	b.	Mention the important of the depletion region width in the photodetector. Also explain the operation of p-i-n photodiode with neat diagram.	8	L3	CO2
	c.	Give any four important LED materials and its properties.	4	L1,2	CO2
		Module – 3			
Q.5	a.	Write short note on: i) Emitter injection efficiency ii) Current transfer ratio iii) Base to collector current amplification factor iv) Avalanche breakdown in transistor	10	L2	CO3

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

	b.	Explain the simple switching circuit for a transistor in the common emitter configurations and its load line diagram.	6	L2,3	CO3
	c.	Explain the effect of base narrowing with neat diagram.	4	L3	CO3
		OR			
Q.6	a.	With neat diagrams explain the process flow of double poly silicon self aligned n-p-n BJT.	10	L2	CO3
	b.	Derive the expression of Ebers-Moll model equations of the I_E and I_C for the coupled diode model.	10	L3	CO3
		Module – 4			
Q.7	a.	Explain the structure and operation of n-channel enhancement MOSFET and obtain the current voltage relationship.	10	L2,3	CO4
	b.	Discuss, ideal C-V characteristics of the MOS-capacitor with a p-type substrate.	8	L3	CO4
	c.	Draw the energy band diagram of the MOS capacitor with an n-type substrate for a positive gate bias and a large negative gate bias.	2	L2	CO4
		OR			
Q.8	a.	Explain, n-channel pnJFET operation for a different gate and drain voltage.	10	L2,3	CO4
	b.	Draw and explain the small signal equivalent circuit of a JFET and obtain the expression for transconductance (g_m) and plot the graph with respect to V_{gs} values.	6	L3	CO4
	c.	Calculate the cut-off frequency of a silicon JFET for the following parameters: $\mu_n = 1000\ cm^2/v\text{-}s$; a = 0.60 μm ; $N_d = 10^{16}\ cm^{-3}$; L = 5 μm ; $\epsilon_s = 8.85 \times 10^{-14}$.	4	L3	CO4
		Module – 5			
Q.9		Briefly describe the following fabrication process of p-n junction.			
	a.	Rapid thermal processing.	6	L3	CO5
	b.	Ion implantation.	6	L3	CO5
	c.	Metallization and the steps involved in the fabrication of p-n junction.	8	L3	CO5
		OR			
Q.10	a.	With neat diagram, explain the formation of p-channel and n-channel devices on the p^- substrate. Also explain the twin well process in CMOS integration.	10	L2	CO5
	b.	Draw and explain, the equivalent circuit of the various parasitic capacitive elements associated with a multilevel inter connect and contacts.	6	L2,3	CO5
	c.	Explain the working of low pressure chemical vapor deposition reactor.	4	L2	CO5

* * * * *

Institute of Engineering & Technology LIBRARY Mangalore

CBCS SCHEME - Make-Up Exam

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

BEC401

Fourth Semester B.E/B.Tech. Degree Examination, June/July 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
1	a.	State vector form of Coulomb's law of force between two point charges and indicate the units of quantities in the equation.	6	L2	CO1
	b.	Q_1 and Q_2 are the point charges located at (0, –4, 3) and (0, 1, 1). If Q_1 is 2nc, find Q_2 such that the force on a test charge at (0, –3, 4) has no Z component.	8	L3	CO1
	c.	Calculate the electric field intensity at a point (3, 4, 5) due to a charge of 5 nc placed at (1, 2, 3).	6	L3	CO1
		OR			
2	a.	Derive an expression for the electric field intensity due to infinite line charge.	8	L2	CO1
	b.	Find $\vec{D}$ in Cartesian co-ordinate system at point P(6, 8, –10) due to: i) a point charge of 40 mc at the origin ii) a uniform line charge of $\rho_L = 40$ μc/m on the Z–axis.	8	L3	CO1
	c.	Define electric flux and flux density.	4	L1	CO1
		Module – 2			
3	a.	State and prove Gauss law as applied to an electric field.	8	L3	CO2
	b.	The flux density $D = \frac{r}{3}\vec{a}_r$ nc/m^2 is in the free space i) Find $\vec{E}$ at r = 0.2m ii) Find the total electric flux leaving the sphere of r = 0.2 m iii)Find the total charge within the sphere of r = 0.3m.	8	L3	CO2
	c.	Find the divergence of $\vec{A}$ at $P\left(5, \frac{\pi}{2}, 1\right)$ where $A = r\ Z\sin\phi\vec{a}_r + 3rZ^2\cos\phi\vec{a}_\phi$.	4	L3	CO2
		OR			
4	a.	State and prove Gauss divergence theorem.	8	L3	CO2
	b.	If the potential field V is V = 100 $(x^2 - y^2)$. Find $\vec{E}$, V at a point (2, –1, 3) and the equation representing the locus of all points having a potential of 300 V.	4	L3	CO2
	c.	Derive continuity of current equation.	8	L2	CO2
		Module – 3			
5	a.	Using Biot-Savart's law, determine the magnetic field intensity at a pint due to infinite long straight conductor.	7	L3	CO3
	b.	Verify the potential field given below satisfies the Laplace's equation : $V = 2x^2 - 3y^2 + z^2$.	5	L3	CO3
	c.	Derive Laplace and Poisson's equations and write Laplace equation in all 3 co-ordinate systems.	8	L2	CO3

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575 006

		OR			
6	a.	State and explain Amperes circuital law.	8	L2	CO3
	b.	Given that the general vector $\vec{A}$ is $\vec{H} = 2.5\vec{a}_v + \vec{a}_\phi$ in spherical co-ordinates. Find the curl of H at (2, π/6, 0).	6	L3	CO3
	c.	Given that the vector magnetic potential $\vec{A} = x^2\,\vec{a}_x + 2yz\,\vec{a}_y + (-x)^2\,\vec{a}_z$. Find the magnetic flux density.	6	L3	CO3
		Module – 4			
7	a.	Derive the expression for the force between two differential current elements.	6	L2	CO4
	b.	A point charge of Q = –1.2c has velocity $\vec{V} = (5\vec{a}_x + 2\vec{a}_y - 3\vec{a}_z)$ m/sec. Find the magnitude of the force exerted on the charge if : i) $\vec{E} = -18\vec{a}_x + 5\vec{a}_y - 10\vec{a}_z$ V/m ii) $\vec{B} = -4\vec{a}_x + 4\vec{a}_y + 3\vec{a}_z$ T iii) Both are present simultaneously.	9	L3	CO4
	c.	A conductor 6 m long lies along Z–direction with a current of 2A in $\vec{a}_z$ direction. Find the force experienced by conductor if $\vec{B} = 0.08\vec{a}_x$ T.	5	L3	CO4
		OR			
8	a.	Write a note on : i) Magnetization ii) Permeability iii) Forces on magnetic materials.	6	L1	CO4
	b.	If $\vec{B} = 0.05x\,\vec{a}_y$ T in a material for which $x_m = 2.5$. Find : i) μ_r ii) μ iii) $\vec{H}$ iv) $\vec{M}$ v) $\vec{J}$.	8	L3	CO4
	c.	Discuss on magnetic boundary conditions.	6	L2	CO4
		Module – 5			
9	a.	List Maxwell's equations for steady and time varying field in : i) Point form ii) Integral form.	6	L2	CO5
	b.	State and explain Faraday's law of electromagnetic induction.	6	L2	CO5
	c.	If the magnetic field $\vec{H} = [3x\cos\beta + 6y\sin\alpha]\vec{a}_z$. Find current density $\vec{J}$ if fields are invariant with time.	8	L3	CO5
		OR			
10	a.	Obtain solution of the wave equation for a uniform plane wave in free space.	8	L1	CO5
	b.	State and prove Poynting theorem.	8	L3	CO5
	c.	Wet marshy soil is characterized by $\sigma = 10^{-2}$ s/m, $\epsilon_r = 15$ and $\mu_r = 1$. Show that at 60 Hz, it can be considered as good conductor. Hence at 60 Hz calculate : i) Skin depth ii) Intrinsic impedance iii) Propagation constant.	4	L3	CO3

* * * * *

Institute of Engineering & Technology LIBRARY Mangaluru-575007

CBCS SCHEME - Make-Up Exam

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
1	a.	Define the Auto correlation and Cross correlation. Discuss the properties of auto correlation.	10	L2	CO5
	b.	Define Probability. Illustrate the relationship between sample space , event and probability.	5	L2	CO5
	c.	Develop a program to generate the probability density function of Gaussian distribution function.	5	L3	CO5
		OR			
2	a.	Explain Conditional Probability. Prove that P(B/A) = P(A/B) . P(B) / P(A).	6	L2	CO5
	b.	Explain Central Limit Theorem as applied to Gaussian Random Process.	6	L2	CO5
	c.	Explain properties of Gaussian Process with necessary equations.	8	L3	CO5
		Module – 2			
3	a.	Write a MATLAB code to generate Amplitude Modulation and demodulation waveforms and display its spectrums.	8	L3	CO2
	b.	Explain the working principle of lattice type balanced modulator with neat circuit diagram.	8	L2	CO2
	c.	Ab AM transmitter has a carrier power of 30 W. The % of modulation is 85%. Calculate a) P_T b) P_{SB} in one side band	4	L3	CO2
		OR			
4	a.	Explain how amplitude modulated wave generated using diode modulator.	8	L2	CO2
	b.	Explain the working of transmitter and receiver of Frequency Division Multiplexing (FDM).	8	L2	CO2
	c.	Explain disadvantages of DSB and SSB.	4	L2	CO2

A.J. Institute of Engineering & Technology LIBRARY

		Module – 3			
5	a.	Define PLL. Explain with neat circuit diagram of FM demodulator using IC 565.	8	L2	CO2
	b.	Explain the demodulation process of frequency modulator using slope detector.	8	L2	CO2
	c.	What is the maximum Band width of an FM signal with a deviation of 30 KHz and a maximum modulating signal of 5KHz. Determine i) M.I ii) Bandwidth.	4	L3	CO2
		OR			
6	a.	Draw the block diagram of a super heterodyne receiver and explain the function of each block.	8	L2	CO2
	b.	Explain the Noise suppression effects of FM with necessary waveform.	6	L2	CO2
	c.	Compare Amplitude Modulation (AM) versus Frequency Modulation (FM).	6	L2	CO2
		Module – 4			
7	a.	What is quantization process? Derive output signal to noise ratio of uniform quantizer $(SNR)_0 = \left(\frac{3P}{m_{max}}\right) . 2^{2R}$ Where P average power of m(t).	10	L3	CO3
	b.	Explain the Regeneration of PCM waves with a neat block diagram.	5	L2	CO3
	c.	Explain important advantages of digital signals over analog signals.	5	L2	CO3
		OR			
8	a.	Explain the generation and detection of PPM wave with neat diagram.	10	L2	CO3
	b.	An analog signal is specified by the equations : i) $x(t) = 3 \cos(50 \pi t) + 10 \sin(300 \pi t) + \cos(100 \pi t)$ ii) $x(t) = \frac{1}{2\pi} \cos(4000 \pi t) . \cos(1000 \pi t)$.	10	L3	CO3
		Module – 5			
9	a.	Define ISI. Explain base band binary data transmission with beat block diagram and necessary equations.	10	L2	CO4
	b.	Explain the different types of external and internal noise.	5	L2	CO4
	c.	Write a note on Eye diagram.	5	L2	CO4
		OR			

10	a.	Explain the following concept briefly : i) Nyquist criterian for distrotionless transmission ii) Base band M – array PAM transmission iii) Band width requirement of T_1 system.	**12**	**L2**	**CO4**
	b.	With a neat diagram, explain the concept of noise in cascaded stages. Write Friis formula and mention its terms.	**8**	**L2**	**CO4**

A.J. Institute of Engineering & Technology
LIBRARY
Mangaluru-575006

* * * * *

VTU-13-10-2025 08:48:06am
JK - JK - JK - JK - JK - JK - JK - JK - JK
13-10-2025 09:01:43am
JK - JK - JK - JK - JK - JK - JK - JK - JK

CBCS SCHEME - Make-Up Exam

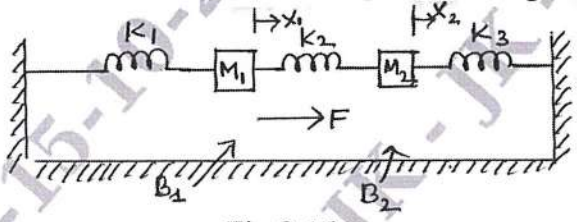
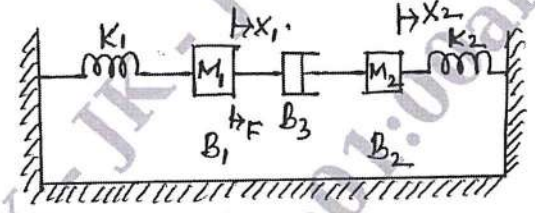
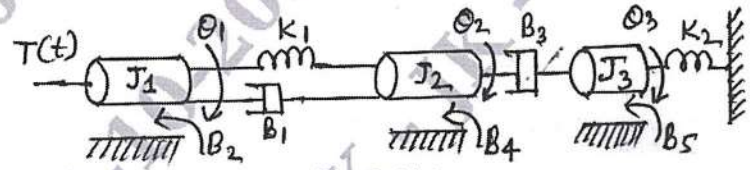
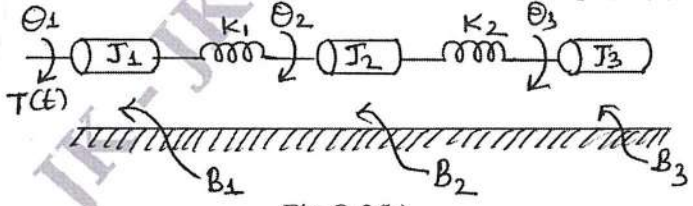
USN | | | | | | | | | | |

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. List any four differences between Open Loop Control system and Closed Loop Control system.	4	L2	CO1
	b.	For the physical system shown in Fig.Q.1(b) draw its mechanical model and obtain equivalent electrical system using Force-voltage method.  Fig.Q.1(b)	8	L3	CO1
	c.	For the mechanical system shown in Fig.Q.1(c) draw its mechanical model and obtain its equivalent electrical system using Force-current method.  Fig.Q.1(c)	8	L3	CO1
		OR			
Q.2	a.	For the mechanical system shown in Fig.Q.2(a) write the differential equations and obtain its equivalent electrical system using Torque-voltage method.  Fig.Q.2(a)	7	L3	CO1
	b.	Draw the mechanical model and obtain the equivalent electrical network using Torque-current method for the system shown in Fig.Q.2(b).  Fig.Q.2(b)	8	L3	CO1

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

			Marks	Level	CO
	c.	With the help of neat diagrams and necessary equations, explain the basic elements of translational motion.	5	L2	CO1

Module – 2

			Marks	Level	CO
Q.3	a.	Find $\frac{C(S)}{R(S)}$ using Mason's gain formula for the graph shown in Fig.Q.3(a).	6	L3	CO1

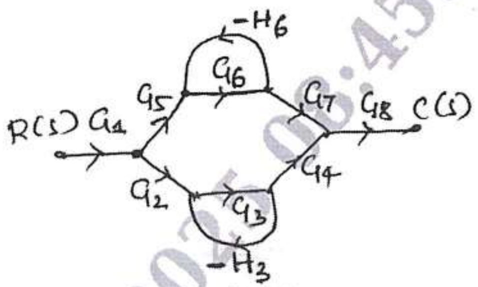


Fig.Q.3(a)

			Marks	Level	CO
	b.	Find $\frac{C(S)}{R(S)}$ using block diagram reduction technique for the block diagram shown in Fig.Q.3(b).	6	L3	CO1

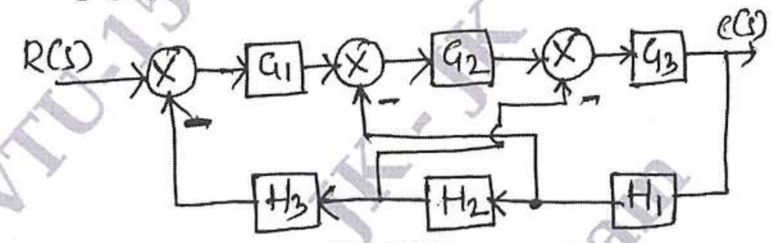


Fig.Q.3(b)

			Marks	Level	CO
	c.	Obtain the expression for C_1 and C_2 for the multiple input multiple output system shown in Fig.Q.3(c).	8	L3	CO1

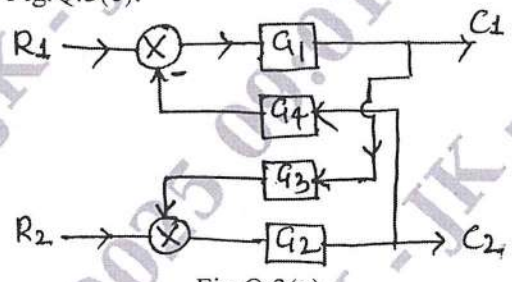


Fig.Q.3(c)

OR

			Marks	Level	CO
Q.4	a.	Obtain $\frac{C(S)}{R(S)}$ using block diagram reduction rules for the Fig.Q.4(a).	8	L3	CO1

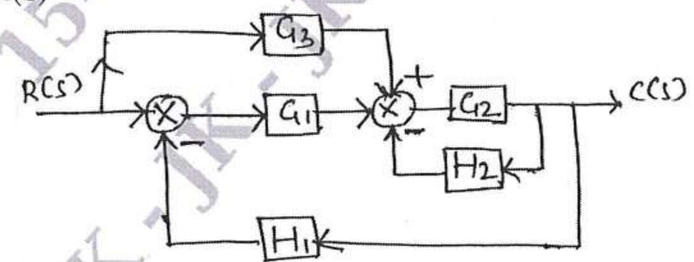
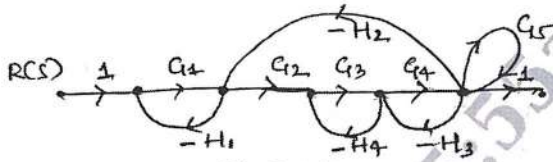
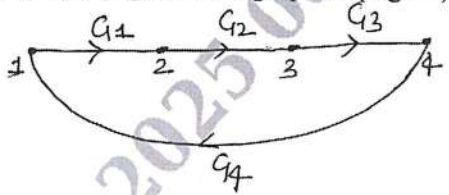
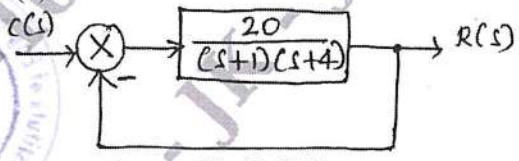


Fig.Q.4(a)

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

VTU 15-10-2025 08:45:55am - JK - JK - JK

	b.	Find $\frac{C(S)}{R(S)}$ for the signal flow graph using Masons gain formula.  Fig.Q.4(b)	7	L3	CO1
	c.	Write MATLAB code to find the transfer function of the signal flow graph shown below in Fig.Q.4(c) (signal flow graph in page >).  This signal flow graph is Fig.Q.4(c)	5	L3	CO1
		Module – 3			
Q.5	a.	With the help of waveforms, mathematical expressions and Laplace transform explain the standard test inputs.	8	L2	CO2
	b.	A unit step input is applied to the unity feedback system for which open loop transfer function $G(S) = \frac{16}{S(S+8)}$. Find : i) Its closed TF ii) Natural frequency of oscillations 'ω_n' iii) Damping ratio 'ξ' iv) Damped frequency of oscillations 'ω_d'	6	L3	CO2
	c.	For a unity feedback system $G(S) = \frac{10}{S(S+1)}$. Find: i) Static error coefficients ii) Steady state error for unit step unit ramp and unit parabolic input iii) e_{ss} for $r(t) = 1 + t + t^2/2$	6	L3	CO2
		OR			
Q.6	a.	Obtain the closed loop transfer function damping ratio, natural frequency and expression for the output response if subjected to unit step input. Shown in Fig.Q.6(a).  Fig.Q.6(a)	8	L3	CO2
	b.	A system has 30% overshoot and settling time of 5 seconds for an unit step input. Determine : i) Transfer function ii) Peak time (t_p) iii) Output response	8	L3	CO2

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

	c.	Write a MATLAB code to plot the response of a second order system for unit step input by considering $w_n = 5$ and damping ratio 'ξ' of 0.2.	4	L3	CO2
		Module – 4			
Q.7	a.	Explain the Hurwitz criteria. What are the draw backs of Hurwitz criteria?	4	L2	CO2
	b.	$S^6 + 4s^5 + 3s^4 - 16s^2 - 64s - 48 = 0$. Find the number of roots of this equation with positive real part, negative real part and zero real part.	8	L3	CO2
	c.	State angle condition and magnitude condition in case of root locus. Consider the system with $G(S)H(S) = \dfrac{K}{S(S+4)}$. Test a point s = -2 + j5 for its existence on root locus. Also find corresponding K.	8	L3	CO3
		OR			
Q.8	a.	Write the procedure for constructing root locus.	8	L2	CO3
	b.	Sketch the complete root locus of system having $G(S)H(S) = \dfrac{K}{S(S+1)(S+2)(S+3)}$	12	L3	CO3
		Module – 5			
Q.9	a.	For a certain control system $G(S)H(S) = \dfrac{K}{S(S+2)(S+10)}$ Sketch the Nyquist plot and hence calculate range of values of 'K' for stability.	10	L3	CO4
	b.	Draw the bode plot for a system having $G(S) = \dfrac{K(1+0.2S)(1+0.025S)}{S^3(1+0.001S)(1+0.005S)}$. Show that the system is conditionally stable. Find range of 'K' for which the system is stable. (Unity feedback).	10	L3	CO4
		OR			
Q.10	a.	Construct the state model using phase variables for a system described as $\dfrac{d^3y(t)}{dt^3} + \dfrac{4d^2y(t)}{dt^2} + \dfrac{7dy(t)}{dt} + 2y(t) = 5u(t)$	6	L3	CO5
	b.	Find the state transition matrix for $A = \begin{bmatrix} 0 & -1 \\ +2 & -3 \end{bmatrix}$	8	L3	CO5
	c.	Explain the properties of state transition matrix.	6	L2	CO5

Institute of Engineering & Technology LIBRARY Mangaluru-575006

* * * * *

CBCS SCHEME - Make-Up Exam

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

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 neat architecture diagram explain the features of 8051 microcontroller.	8	L2	CO1
	b.	Explain 4 I/O ports circuitry of 8051 with neat circuit diagram.	8	L2	CO1
	c.	Differentiate microprocessor and microcontroller.	4	L1	CO1
		OR			
Q.2	a.	Interface the RAMN of 8 Kbytes with starting address C000H and ROM of 32 Kbytes.	8	L3	CO1
	b.	With neat diagram explain the internal memory structure and programming model of 8051 microcontroller.	8	L2	CO1
	c.	Which are the criteria for choosing a microcontroller?	4	L1	CO1
		Module – 2			
Q.3	a.	Explain different types of bit and byte Jump instructions.	6	L2	CO2
	b.	Analyse the following instructions with example : i. MOVX A, @DPTR ii. DA A iii. RLC A.	6	L3	CO2
	c.	Write an assembly language program to arrange the given array of numbers stored at starting address 30 H. (Assume array of 5, 8-bit numbers) in ascending order.	8	L3	CO2
		OR			
Q.4	a.	Write an assembly level program to add the five consecutive 8 bit numbers located in RAM location with starting address 40 H. Store the 16 bit result in 50 H (lower byte) and 51 H(higher byte).	8	L3	CO2
	b.	Explain various addressing modes of 8051 microcontroller with example.	8	L2	CO2
	c.	What is stack? Explain the working of PUSH and POP instructions.	4	L1	CO2

Institute of Engineering & Technology LIBRARY Mangaluru-575025

		Module – 3			
Q.5	**a.**	Explain the timer mode 1 and mode 2 operation.	**6**	**L2**	**CO3**
	b.	With neat diagram list and analyse the bit contents of TMOD and TCON registers.	**6**	**L1**	**CO3**
	c.	Write an assembly language program to generate a square wave with an ON time of 3 ms and on OFF time of 10 ms on all pins of port 0. Assume an XTAL of 22 MHz. Use Timer 0 in mode 1.	**8**	**L3**	**CO3**
		OR			
Q.6	**a.**	Write an 8051 C program to transfer the message "HELLO" serially at 9600 band continuously. Use 8-bit data, 1 stop bit.	**8**	**L3**	**CO3**
	b.	Write an 8051 C program to receive bytes of data serially and put them in port P0 and P2. Set the baud rate at 9600, 8 bit data and 1 stop bit. Use Timer 1 for baud rate generation.	**8**	**L3**	**CO3**
	c.	List and explain working of pins of RS 232 DB – 9 connector.	**4**	**L1**	**CO3**
		Module – 4			
Q.7	**a.**	List out 8051 interrupt priority upon reset from highest to lowest with their vector address, what are the uses ands function of six interrupts of 8051.	**8**	**L2**	**CO4**
	b.	Write an assembly program to generate two square wave. One of 5 KHz frequency at P1.3 and another of frequency 25 KHz at P2.3. Assume XTAL = 22 MHz.	**8**	**L2**	**CO4**
	c.	What is an interrupt? Compare interrupt vs polling.	**4**	**L1**	**CO4**
		OR			
Q.8	**a.**	Write an assembly program I which 10 bytes of data stored in RAM locations starting from 45 H are transferred serially. At the end of data transfer the value of RO is displayed on P1. Use timer 1 mod 2 (baud rate 9600).	**8**	**L3**	**CO4**
	b.	What are the steps involved in executing interrupt.	**4**	**L2**	**CO4**
	c.	With neat diagram explain bit contents of interrupt priority (IP) register and interrupt enable (IE) register.	**8**	**L2**	**CO4**

VTU-17-10-2025 08:38:57am - JK - JK - JK - JK - JK - JK
JK - JK - JK - JK - JK - JK - JK - JK - JK - JK - JK - JK
17-10-2025 09:00:36am
Technology LIBRARY

		Module – 5			
Q.9	**a.**	Explain the operation and pin description of LCD display.	**6**	**L2**	**CO5**
	b.	With neat diagram explain internal architecture of ADC 0804 chip.	**8**	**L2**	**CO5**
	c.	With the help of diagrams explain the working of DC motor rotation clock wise and counter clock wise direction using H-bridge connection.	**6**	**L2**	**CO5**
		OR			
Q.10	**a.**	A switch is connected to pin 2.7. Write a C program to monitor the status of switch (SW) and perform the following : i. If SW = 0, stepper motor moves clockwise ii. If SW = 1, the stepper motor moves counter clockwise.	**10**	**L3**	**CO5**
	b.	A door sensor is connected to the P1.1 pin and Buzzer is connected to P1.7. Write 8051 C program to monitor the door sensor and when it opens, sound the buzzer. You can sound the buzzer by sending square wave of few hundred Hz.	**10**	**L3**	**CO5**

* * * * *

VTU-17-10-2025 08:38:57am JK - JK - JK - JK - JK
17-10-2025 09:00:36am JK - JK - JK - JK - JK
A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

CBCS SCHEME - Make-Up Exam

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.	Describe the functions of management.	10	L1	CO1
	b.	Illustrate the roles of a manager.	10	L2	CO1
		OR			
Q.2	a.	Explain the steps involved in planning.	10	L1	CO1
	b.	Illustrate the types of decision making.	10	L2	CO1
		Module – 2			
Q.3	a.	Describe the need of staffing.	10	L1	CO2
	b.	Illustrate the principles of organization with examples.	10	L2	CO2
		OR			
Q.4	a.	Explain the need for control system in management.	10	L1	CO2
	b.	Interpret recruitment with the help of steps in selection process.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the meaning of social responsibility with example.	10	L1	CO3
	b.	Interpret the importance of entrepreneurship.	10	L2	CO3
		OR			
Q.6	a.	Define Business Audit. Explain four factors based on which a manager can decide which is ethical or unethical.	10	L1	CO3
	b.	Interpret entrepreneurial development cycle.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain the problems faced by small scale industries.	10	L1	CO4
	b.	Interpret that creativity and innovation play a vital role in the success of business.	10	L2	CO4

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

		OR			
Q.8	**a.**	Describe Political Feasibility and Economic Feasibility.	**10**	**L1**	**CO4**
	b.	Demonstrate that social and legal feasibilities are important for efficient running of business.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain government schemes for funding business.	**10**	**L1**	**CO5**
	b.	Demonstrate that venture capital plays a pivotal role in entrepreneurship.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Describe the challenges faced entrepreneurs when starting their own business.	**10**	**L1**	**CO5**
	b.	Demonstrate that network analysis in a ubiquitous tool in project design.	**10**	**L2**	**CO5**

* * * * *

VTU-08-10-2025 01:18:39pm - JK - JK - JK
JK - JK - JK - JK - JK - JK - JK
08-10-2025 01:32:05pm
A.J. Institute of Engineering & Technology • Mangaluru-575006 • LIBRARY

CBCS SCHEME - Make-Up Exam

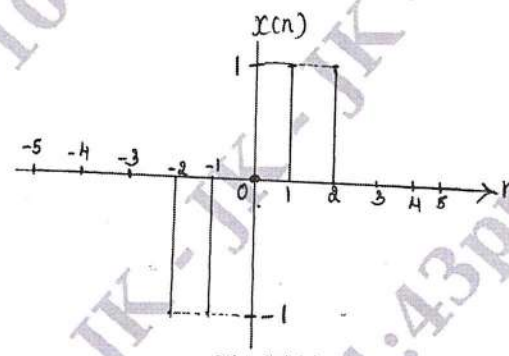
USN | | | | | | | | | | |

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.	Define signals and systems. Briefly explain any two classifications of signals.	6	L1	CO1
	b.	Determine whether the following signals are periodic or not? If periodic determine the fundamental period. i) $x(n) = \cos\frac{\pi n}{2}\cos\frac{\pi n}{4}$ ii) ii) $x(n) = \cos(100\pi n) + \sin(5\pi n)$	8	L2	CO1
	c.	Determine the even and odd components of figure Q1(c)  Fig Q1(c)	6	L2	CO1
		OR			
Q.2	a.	Define the following with an example causal system, memoryless system and linear system.	6	L1	CO1
	b.	Verify the following system are Linear, time in variant, causal stable $y(n) = ax(n)+b$	6	L2	CO1
	c.	Determine the response of the system if, $x(n) = \{\underset{\uparrow}{1}, 2, 3, 1\}$ $h(n) = \{1, \underset{\uparrow}{2}, 0, -1\}$.	8	L2	CO2
		Module – 2			
Q.3	a.	Analyze the given function to calculate the Z-transform and indicate ROC. $x(n) = \alpha^{\lvert n\rvert}$; $\lvert\alpha\rvert < 1$.	8	L3	CO2
	b.	Write a program to compute N-point DFT of a given sequence (without using built in function) and to plot the magnitude and phase spectrum.	8	L3	CO3
	c.	Find the DFT of the sequence $x(n) = \cos\left(\frac{n\pi}{4}\right)$.	4	L2	CO3

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

		OR			
Q.4	**a.**	Find the Z-transform of the signal $x(n) = n\left(\frac{1}{3}\right)^n u(n)$	**8**	**L2**	**CO2**
	b.	Write a program to compute linear and circular convolution of any two sequences using DFT and IDFT.	**8**	**L3**	**CO3**
	c.	Compute the IDFT of sequence $x(k) = \{10, -2+2j, -2, -2-2j\}$	**4**	**L3**	**CO3**
		Module – 3			
Q.5	**a.**	State and prove the multiplication property of DFT.	**10**	**L2**	**CO3**
	b.	Let $h(n) = \{1, 1, 1\}$ and $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$. Obtain the output y(n) using overlap save method.	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	State and prove the property of Parseval's theorem.	**10**	**L2**	**CO3**
	b.	Compute the 8-point DFT of the sequence {1, 2, 3, 4, 4, 3, 2, 1} using DIT FFT.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	For the given system function. Draw the direct form and cascade form. $H(z) = 1 + 5/2z^{-1} + 2z^{-2} + 2z^{-3}$	**10**	**L2**	**CO4**
	b.	Design a high pass FIR filter using hamming window. Give $W_c = 1$ rad/sec and $M = 7$.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	The linear phase FIR filter frequency response is $H[e^{jw}] = e^{-j3w}[2 + 1.8\cos 3w + 1.2\cos 2w + 0.5\cos w]$. Find impulse response sequence of the filter.	**10**	**L3**	**CO4**
	b.	With the equations, sketch the spectrum of following windows. i) Rectangular ii) Bartlett iii) Hanning	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	From the given difference equation obtain the equation for H(z) and Also, realize it using Direct form – I and Direct form – II $y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$.	**10**	**L2**	**CO5**
	b.	Explain the Analog filters translation using Low pass prototype transformation.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Write a program to Design and Implement i) IIR Butterworth low pass filter ii) IIR Butterworth high pass filter	**10**	**L3**	**CO5**
	b.	Design a digital Butterworth filter with the following specifications. $0.707 \le \lvert H(e^{jw}) \rvert \le 1$; $0 \le w \le 0.5\pi$ $\lvert H(e^{jw}) \rvert \le 0.2$; $0.75\pi \le w \le \pi$ Determine system function H(z) for a Butterworth filter using bilinear transformation.	**10**	**L3**	**CO5**

Institute of Engineering & Technology LIBRARY Mangaluru-575006

CBCS SCHEME - Make-Up Exam

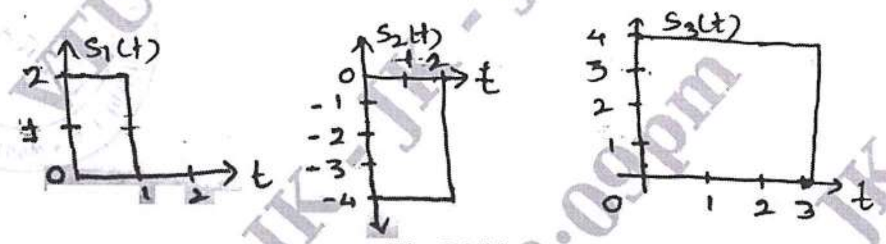
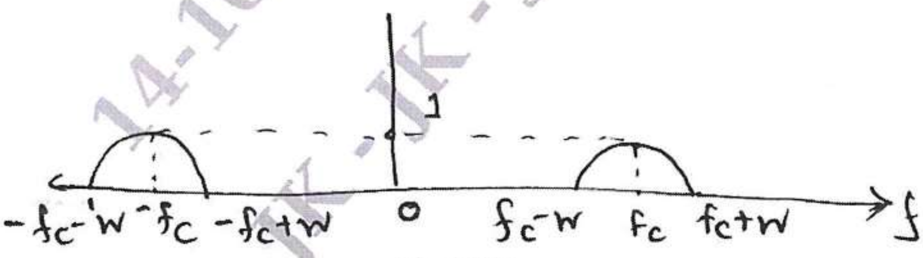
USN | | | | | | | | | | |

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.	Define Hilbert transform. Mention its applications. Show that a signal g(t) and its Hilbert transform are orthogonal over the entire time interval $(-\infty, \infty)$.	6	L2	CO1
	b.	Using Gram-Schmidth orthogonalization proceducer calculate a set orthonormal basis functions to represent the three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ shown in Fig.Q1(b). Also express each of these signals in terms of the set of basis functions.  Fig.Q1(b)	8	L3	CO1
	c.	Describe the correlation receiver with the neat diagrams and the maximum – likelihood decoder.	6	L2	CO1
		OR			
Q.2	a.	Express band pass signal s(t) in canonical form. Represent the in phase and quadrature components of the bandpass signal s(t).	6	L2	CO1
	b.	Determine pre-envelope and complex – envelope of the signal shown in Fig.Q2(b).  Fig.Q2(b)	6	L3	CO1
	c.	Discuss the operation of matched filter receiver with necessary diagram.	8	L2	CO1

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

VTU-14-10-2025 01:26:05pm - JK - JK - JK
JK - 14-10-2025 01:33:09pm - JK - JK - JK

		Module – 2			
Q.3	**a.**	Describe the generation and reception of BPSK signal with a necessary equation and constellation diagram.	**10**	**L3**	**CO2**
	b.	The binary sequence 1100100010 is applied to the DPSK transmitter : (i) Sketch the resulting waveform at the transmitter output (ii) Applying this waveform to the DPSK receiver show that in the absence of noise, the original binary sequence is reconstructed at the receiver output.	**6**	**L2**	**CO2**
	c.	Explain M-ary QAM. Mention its advantage over M-ary PSK system. Obtain the constellation of QAM for M = 4 and draw signal space diagram.	**4**	**L2**	**CO2**
		OR			
Q.4	**a.**	Derive the expression for error probability of BFSK using coherent detection.	**8**	**L3**	**CO2**
	b.	Binary data are transmitted over a microwave link at the rate of 10^6 BPS and PSD of noise at the receiver is 10^{10} watts/Hz. Compute the average carrier power required to maintain an average probability of error $P_e \leq 10^{-4}$ for the following cases : (i) Binary PSK using coherent detection (ii) DPSK Note : take $\text{erfc}(2.63) = 2 \times 10^{-4}$ $Q(3.7) = 10^{-4}$	**6**	**L2**	**CO2**
	c.	With a neat block diagram outline the generation and coherent detection of QPSK signal.	**6**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Briefly discuss entropy and information rate. Derive the expression of average information content of a zero memory source.	**6**	**L2**	**CO3**
	b.	An international Morse code uses a sequence of symbols of dots and dashes to transmit letters of English alphabet. The dash is represented by a current pulse of duration 2 msec and dot by a duration of 1 msec. The probability of dash is half that of dot. Consider 1 msec duration of gap is given in between symbols. Calculate : (i) Self information of a dot and a dash (ii) An average information content of a dot-dash code (iii) Average rate of information.	**6**	**L3**	**CO3**
	c.	An information source produces a sequence of independent symbols having the following probabilities. $S = \{s_1\ s_2\ s_3\ s_4\ s_5\ s_6\ s_7\}$, $P = \left\{\frac{1}{3}, \frac{1}{27}, \frac{1}{3}, \frac{1}{9}, \frac{1}{9}, \frac{1}{27}, \frac{1}{27}, \right\}$ Construct the binary and ternary code using Huffman encoding procedure. Find its efficiency and redundancy.	**8**	**L3**	**CO3**

Institute of Engineering & Technology LIBRARY Mangaluru-575...

OR

Q.6	**a.**	Define mutual information. Derive the expression for mutual information and joint entropy interms of probabilities.	**6**	**L2**	**CO3**
	b.	For the JPM given below compute individuality H(X), H(Y), H(X, Y), H(X/Y), H(Y/X). $$P(X,Y)=\begin{bmatrix}0.05 & 0 & 0.2 & 0.05\\ 0 & 0.1 & 0.1 & 0\\ 0 & 0 & 0.2 & 0.1\\ 0.05 & 0.05 & 0 & 0.1\end{bmatrix}.$$	**7**	**L3**	**CO3**
	c.	A binary symmetric channel has the following noise matrix with source probabilities of $P(x_1)=\frac{2}{3}$ $P(x_2)=\frac{1}{3}$ $P(Y/X)=\begin{bmatrix}3/4 & 1/4\\ 1/4 & 3/4\end{bmatrix}$ Determine : i) H(X), H(Y) , H(X, Y), H(Y/X), H(X/Y) and I(X, Y) ii) Channel capacity iii) Channel efficiency and redundancy.	**7**	**L3**	**CO3**

Module – 4

Q.7	**a.**	Calculate the generator matrix G and parity check matrix H for a linear block code with matrix H for a linear block code with minimum distance three and a message block size of eight bits.	**4**	**L3**	**CO4**
	b.	Draw the general block diagram of syndrome calculation circuit for cyclic codes and explain its operation.	6	**L2**	**CO4**
	c.	For a systematic (7, 4) linear block code, the parity matrix P is given by $$[P]=\begin{bmatrix}1 & 1 & 1\\ 1 & 1 & 0\\ 1 & 0 & 1\\ 0 & 1 & 1\end{bmatrix}$$ (i) Calculate all possible valid code-vectors (ii) Draw the corresponding encoding circuit (iii) A single error has occurred in each of these received vectors. Detect and correct those errors. a) R_A = [0 1 1 1 1 1 0] b) R_B = [1 0 1 1 1 0 0] c) R_C = [1 0 1 0 0 0 0] (iv) Draw syndrome calculation circuit.	**10**	**3**	**CO4**

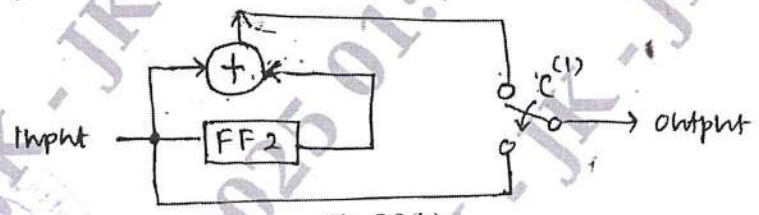
A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

OR

Q.8	**a.**	The generator polynomial for a (15, 7) cyclic code is $g(x) = 1 + x^4 + x^6 + x^7 + x^8$ (i) Compute the code = vector is systematic form for the message $D(x) = x^2 + x^3 + x^4$ (ii) Assume that the first and last bit of the code vector V(x) for $D(x) = x^2 + x^3 + x^4$ suffer transmission errors. Calculate the syndrome of V(x).	**6**	**L3**	**CO4**
	b.	With a neat block diagram and suitable example, describe error – control – based communication system.	**6**	**L2**	**CO4**
	c.	Consider a (6, 3) linear code whose generator 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 weights and distances iii) Minimum weight parity check matrix iv) Draw the encoder circuit for the above codes.	**8**	**L3**	**CO4**

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

Module – 5

Q.9	**a.**	Describe decoding of convolution codes using viterbi algorithm with a suitable example.	**10**	**L2**	**CO5**
	b.	Consider the convolution of encoder shown in Fig.9(b). The code is systematic i) Represent the state diagram ii) Relate the code tree iii) Calculate the endoder output produced by the message sequence 1 0 1 1 1 iv) Verify the output using time-domain approach.  Fig.Q9(b)	**10**	**L3**	**CO5**

OR

Q.10	**a.**	Illustrate recursive systematic convolution codes with a suitable example.	**6**	**L2**	**CO5**
	b.	Consider a (3, 1, 2) convolution encoder with $g^{(1)} = 110$, $g^{(2)} = (101)$, $g^{(3)} = 111$. (i) Encoder block diagram (ii) State table (iii) State transition table (iv) State diagram (v) Compute encoder output traversing through the state diagram for input message sequence of (11101) (vi) Draw the code trellis and obtain the output of the encoder for the same input sequence of (11101).	**14**	**L3**	**CO5**

* * * * *

CBCS SCHEME - Make-Up Exam

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

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.	Define Embedded Systems. Explain the purposes of embedded systems with an examples for each.	10	L2	CO1
	b.	What are the different types of memories used in embedded system design? Explain the role of each.	10	L2	CO1
		OR			
Q.2	a.	With the diagram of elements of embedded system, mention all the cores around which an embedded system is built. Discuss any two in detail	10	L2	CO1
	b.	Write a brief note on the following : i) 7 segment display ii) Brown out protection iii) UART iv) I2C	10	L2	CO1
		Module – 2			
Q.3	a.	Illustrate the domain specific aspect of embedded systems with automotive domain as an example.	10	L2	CO2
	b.	Design drives/passenger 'Seat Belt Warning' in an automotive using the FSM model. The system requirements are captured as i) When the vehicle ignition is turned ON and the seat belt is not fastened within 10 seconds of ignition ON the system generates an alarm signal for 5 seconds. ii) The Alarm is turned OFF when the alarm time (5 seconds) expires or if the driver/passenger, fastens the belt or if the ignition switch is turned off, whichever happens first.	10	L3	CO2
		OR			
Q.4	a.	Illustrate the application specific aspect of embedded systems with washing machine as an example.	10	L2	CO2
	b.	Design an automatic tea/coffee vending machine based on FSM model for the following requirement : i) The tea/coffee vending is initiated by user inserting a 5 rupee coin ii) After inserting the coin, the user can either select 'Coffee' or 'Tea' or press 'Cancel' to cancel the order and take back the coin.	10	L3	CO2

A.J. Institute of Engineering & Technology LIBRARY Mangalore

Module – 3					
Q.5	**a.**	Briefly explain the function of operating system with diagram.	**10**	**L2**	**CO3**
	b.	Explain preemptive SJF scheduling and illustrate with an example.	**10**	**L3**	**CO3**
OR					
Q.6	**a.**	Write a note on racing and deadlock in task synchronization.	**10**	**L2**	**CO3**
	b.	With a diagram, mention function of the components in an embedded system development environment.	**10**	**L2**	**CO3**
Module – 4					
Q.7	**a.**	With a block diagram, explain typical ARM based embedded system.	**10**	**L2**	**CO4**
	b.	What is pipeline in ARM? Explain the different pipeline stages of ARM processor.	**10**	**L2**	**CO4**
OR					
Q.8	**a.**	With a block diagram, explain ARM core dataflow model.	**10**	**L2**	**CO4**
	b.	Write a detailed note on : i) Vector table ii) Exception iii) Interrupts.	**10**	**L2**	**CO4**
Module – 5					
Q.9	**a.**	Explain the different branch instructions of ARM processors.	**10**	**L2**	**CO5**
	b.	Write an ALP with comments to add an array of 16 bit numbers and store the 32 bit result in internal RAM.	**10**	**L3**	**CO5**
OR					
Q.10	**a.**	Explain the different data processing instructions in ARM.	**10**	**L2**	**CO5**
	b.	Write an ALP with comments to sort the array of 32 bit numbers in ascending order using bubble sort method.	**10**	**L3**	**CO5**

* * * * *

A.J. Institute of Engineering & Technology • Mangaluru-575 006 • LIBRARY

JK - JK - JK - JK - VTU 09-10-2025 01:31:28pm

CBCS SCHEME - Make-Up Exam

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
Q.1	a.	Explain CMOS as Logic inverter.	5	L2	CO1
	b.	Draw the schematic diagram of 2-I/P NOR gate and explain the operation.	5	L3	CO1
	c.	Draw the schematic diagram of following Boolean logic: i) $y = \overline{(ABC + D)E}$ ii) $y = \overline{((A+B)\cdot C) + D)}$ iii) $y = \overline{AB + (C + D)}$	10	L3	CO1
		OR			
Q.2	a.	Discuss about types, symbolic representation and physical structure of MOSFET with neat sketches.	8	L2	CO1
	b.	Construct 2-input EXOR gate using transmission gate logic.	6	L3	CO1
	c.	Write the structural representation of 3-input NOR gate.	6	L3	CO1
		Module – 2			
Q.3	a.	Derive the equation for drain current of a MOSFET in non-saturated and saturated region of operations.	8	L2	CO2
	b.	Differentiate PMOS and NMOS transistor.	6	L2	CO2
	c.	What is Latch-up in CMOS inverter? Explain how it can be prevented.	6	L2	CO2
		OR			
Q.4	a.	Explain DC characteristics of CMOS inverter and obtain the relationship for output voltage at different region of DC characteristics.	12	L2	CO2
	b.	Describe the transmission gate logic with neat diagram. Also explain in detail PMOS and NMOS behavior.	8	L2	CO2
		Module – 3			
Q.5	a.	Describe in steps the P-Well process of CMOS technologies with neat sketches.	10	L2	CO3
	b.	Describe Lambda based SOI design rules by appropriate layer representation with dimensions.	10	L2	CO3

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006

		OR			
Q.6	**a.**	Describe the following types of capacitances present in MOS device with relevant equations: i) Parasitic capacitances ii) Diffusion capacitances	**10**	**L2**	**CO3**
	b.	Write short notes on scaling of MOS transistors.	**6**	**L2**	**CO3**
	c.	Explain dynamic power dissipation in CMOS gate.	**4**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the operations of C^2MOS logic and draw the schematic for the function $y = \overline{(A \cdot B + (D + E) \cdot C)}$ using C^2 MOS logic.	**8**	**L3**	**CO4**
	b.	Explain four phase dynamic logic with relevant diagram.	**8**	**L2**	**CO4**
	c.	Draw pseudo NMOS circuit and explain.	**4**	**L2**	**CO4**
		OR			
Q.8	**a.**	Draw schematic representation of CMOS inverter and state its all physical layout considerations and draw its standard layout.	**8**	**L3**	**CO4**
	b.	Explain operations of CVSL logic. State its advantages and disadvantages.	**6**	**L2**	**CO4**
	c.	Write short notes on following I/O structures: i) Input pads ii) Output pads	**6**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the behavior of two-inverter basic Bi-stable element.	**10**	**L2**	**CO5**
	b.	Explain the operation of NOR based SR latch circuit and define related lumped load capacitances at output node.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain any 4 techniques followed for reduction of complexity of IC design in structured design strategies.	**10**	**L2**	**CO5**
	b.	Write short note on following related automated synthesis: i) Procedural module definition ii) Silicon compiler	**10**	**L2**	**CO5**

* * * * *

Institute of Engineering & Technology LIBRARY Mangaluru-575006

CBCS SCHEME - Make-Up Exam

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.	With a block diagram, explain the fundamental steps involved in digital image processing.	10	L2	CO1
	b.	Explain the human visual system with a neat diagram.	05	L2	CO1
	c.	Consider the image segment shown in Table 1(c) with V = {1, 2}. Calculate the length of the shortest 4, 8 and m-path between p and q. Table 1(c) 3 1 2 1 q 2 2 0 2 1 2 1 1 p 1 0 1 2	05	L3	CO1
		OR			
Q.2	a.	Briefly explain the following : (i) Neighbors of a pixel (ii) Connectivity (iii) City block distance (iv) Checker board distance (v) Region	10	L2	CO1
	b.	Explain the Image acquisition using sensor strips and sensor arrays.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the two-dimensional Orthogonal and Unitary Transforms.	10	L2	CO2
	b.	Explain discrete cosine transform and its properties.	10	L2	CO2
		OR			
Q.4	a.	Explain Haar Transforms with equation and hence obtain 2×2 Haar Transform matrix	10	L2	CO2
	b.	State the following properties of 2D-DFT: i) Translation ii) Periodicity iii) Rotation iv) Convolution v) Linearity	10	L2	CO2
		Module – 3			
Q.5	a.	With necessary graphs, explain the following intensity transformation functions: i) Image negative ii) Log transformations iii) Power law transformations	10	L2	CO3
	b.	Briefly explain Contrast Stretching and Bit plane slicing.	10	L2	CO3

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575 006

OR

Q.6	**a.**	For a given image 4×4 having gray scales between [0 , 9]. Perform histogram equalization and draw histogram image before and after equalization 4×4 image show in Table 6(a). Table 6(a) 2 3 3 2 4 2 4 3 3 2 3 5 2 4 2 4	**12**	**L3**	**CO3**
	b.	Explain Laplacian Mask for image sharpening using second order derivatives.	**08**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	With the help of neat diagram, explain basic steps involved in frequency domain filtering.	**10**	**L2**	**CO4**
	b.	Explain Butterworth LPF and Gaussian LPF for image smoothing.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain the pseudo colour image processing with examples.	**10**	**L2**	**CO1**
	b.	Explain different color models used in image processing.	**10**	**L2**	**CO1**
		Module – 5			
Q.9	**a.**	With necessary equation and graphs, explain noise probability density functions.	**10**	**L2**	**CO5**
	b.	Write brief note on restoration in presence of only noise using (i) Mean Filter (ii) Order Statistic Filter (iii) Adaptive Filters	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the estimation of degradation function methods.	**10**	**L2**	**CO5**
	b.	Explain Wiener filtering and Inverse filtering in Image restoration.	**10**	**L2**	**CO5**

* * * * *

A.J. Institute of Engineering & Technology LIBRARY Mangaluru-575006