

First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026

Fundamentals of Electronics & Communication Engineering

Time: 3 hrs.

Max. Marks: 100

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

Module – 1			M	L	C
Q.1	a.	With circuit diagram explain the operation of positive half wave rectifier. Draw the input and output waveforms.	8	L2	CO2
	b.	Explain Zener diode as voltage regulator under no load and full load conditions.	8	L2	CO1
	c.	Calculate the diode current, assuming that the diode has $V_F = 0.7 \text{ V}$ and diode dynamic resistance is 0.25Ω , supply voltage 1.5 V and series resistance has 10Ω .	4	L3	CO1
OR					
Q.2	a.	With circuit diagram explain the operation of full wave bridge rectifier. Draw the input and output waveforms.	8	L2	CO2
	b.	Explain diode logic circuit.	8	L2	CO2
	c.	Calculate current in the circuit when a germanium diode connected in series with a resistor of $2.2 \text{ K}\Omega$ is driven by a 10V DC supply.	4	L3	CO1
Module – 2					
Q.3	a.	Explain the construction and characteristics of N-channel JFET.	8	L2	CO2
	b.	Explain the working operation of NPN transistor.	8	L2	CO2
	c.	Calculate the I_C and I_E for a transistor that has $\alpha_{dc} = 0.98$ and $I_B = 100\text{mA}$. Find the value of β_{dc} for the transistor.	4	L2	CO2
OR					
Q.4	a.	Explain input and output characteristics of BJT in common base configuration.	8	L2	CO2
	b.	Explain N-channel enhancement type MOSFET and describe the construction and working.	8	L2	CO2
	c.	With neat circuit diagram, explain BJT as current amplifier.	4	L2	CO2
Module – 3					
Q.5	a.	Derive the expression for output voltage of an Op-Amp integrator circuit.	7	L2	CO2
	b.	Explain three types of open loop configurations of an op-amp.	7	L2	CO2
	c.	List the characteristics of an ideal op-amp.	6	L1	CO2

OR

Q.6	a.	With circuit diagram, derive the expression for output voltage of a 3 input inverting summing amplifier.	7	L2	CO2
	b.	Explain block diagram of typical Op-Amp.	7	L2	CO2
	c.	Define the following with respect to an op-amp : i) CMRR ii) Slew rate iii) Input offset voltage iv) Input offset current	6	L1	CO2

Module – 4

Q.7	a.	Explain Amplitude and Frequency modulation with neat waveforms.	10	L2	CO3
	b.	Explain Mobile wireless telephone systems.	10	L2	CO3

OR

Q.8	a.	With a block diagram explain the basic elements of a communication system.	10	L2	CO3
	b.	Explain different communication channels and their characteristics.	10	L2	CO3

Module – 5

Q.9	a.	Convert : i) $(10111)_2 = (?)_{10}$ ii) $(FACE.A2B)_{16} = (?)_2$ iii) $(68.28)_{10} = (?)_2$	6	L3	CO4
	b.	Simplify the following Boolean expression: $F = x'y'z + xyz + x'yz + xy'z$.	7	L3	CO4
	c.	Express the Boolean function $F = A + B'C$ as a sum of minterms.	7	L3	CO4

OR

Q.10	a.	Subtract using the 2's complement method. i) $(10111)_2 - (10011)_2$ ii) $(10001)_2 - (11010)_2$	6	L3	CO4
	b.	Draw a logic diagram for the Boolean function $F = x'y + xy'$.	7	L3	CO4
	c.	Construct and describe half adder with neat logic diagram and truth table.	7	L3	CO5

* * * * *

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

1BPHEC102/202

First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026 Quantum Physics and Electronics Sensors (ECE stream)

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.
3. VTU Formula Hand Book is permitted.*

Module – 1			M	L	C
Q.1	a.	Setup Time independent Schrödinger wave equation in one dimension.	8	L2	CO1
	b.	Explain the wave function; mention its properties and physical significance of a wave function. Discuss the principle of complementarity.	8	L2	CO1
	c.	Calculate the de-Broglie wavelength of an electron having kinetic energy 100eV.	4	L3	CO1
OR					
Q.2	a.	Discuss Heisenberg's uncertainty principle and state the three relationships. Using energy-time uncertainty to explain the broadening of spectral lines.	8	L2	CO1
	b.	Derive a normalized wave function for a particle inside one-dimensional infinite potential well using Schrodinger wave equation.	8	L2	CO1
	c.	An electron is bound to 1-D potential well width 10Å & infinite height. Find the energy value in eV for the ground state and first excited state.	4	L3	CO1
Module – 2					
Q.3	a.	Define fermi factor. Discuss the variation of fermi factor with temperature and energy.	7	L2	CO2
	b.	Derive the expression for hall voltage with a neat diagram and mention its application.	8	L2	CO2
	c.	Find the temperature at which there is 1% probability that a state with an energy 0.5 eV above the fermi energy is occupied.	5	L3	CO2
OR					
Q.4	a.	Explain the failure of classical free electron theory of metals and list the assumptions of quantum free electron theory.	8	L2	CO2
	b.	Derive the expression for carrier concentration in an metals.	8	L2	CO2
	c.	The concentration of electrons at room temperature in an extrinsic semiconductor used in hall experiment is $1.7 \times 10^{29} \text{ m}^{-3}$. If a current of 100 A flows through the semiconductor strip of thickness 1 mm and the strength of the magnetic field perpendicular to the strip is 3.6 wb/m^2 . Estimate the hall co-efficient and hall voltage.	4	L3	CO2

Module – 3

Q.5	a.	Distinguish between Type I and Type II superconductors using M-H characteristics.	8	L2	CO3
	b.	Explain the term critical temperature, critical field mention the relation between I_c and H_c , and define critical current.	7	L2	CO3
	c.	For a superconducting sample with critical temperature 7.2 K and critical field at 0K is 6.5×10^{-4} A/m. find the critical field at 4 K.	5	L3	CO3

OR

Q.6	a.	Derive the relation for the critical current in a cylindrical wire using ampere's law (Silsbee effect).	8	L2	CO3
	b.	Explain the phenomenon of superconductivity. Discuss qualitatively BCS theory of superconductivity.	8	L2	CO3
	c.	A superconducting wire of radius 0.5mm carries a current in a magnetic field of 2×10^{-2} T. Calculate the critical current.	4	L3	CO3

Module – 4

Q.7	a.	Derive an expression for energy density in terms of Einstein's A and B coefficients.	8	L2	CO4
	b.	Describe the construction and working of single photon avalanche diode.	8	L2	CO4
	c.	The attenuation of light in an optical fiber is estimated at 2.2 dB/Km. What fractional initial intensity remains after 2 Km and 6Km?	4	L3	CO4

OR

Q.8	a.	Derive an expression for the numerical aperture and acceptance angle of an optical fiber, with the help of neat, labeled diagram.	8	L2	CO4
	b.	Describe the construction and working of a semiconductor laser based on energy level diagram.	8	L2	CO4
	c.	Calculate the V number and number of modes supported by an optical fiber of a core diameter 25 μm , operating at wavelength 1.3 μm with N.A.=0.2	4	L3	CO4

Module – 5

Q.9	a.	Explain the construction and working of Piezoelectric sensors and mention its application.	8	L2	CO5
	b.	What are LDR? Explain the characteristics of LDR and give its application.	8	L2	CO5
	c.	The resistance of a bulb filament is 100Ω at a temperature of 100°C . If its TCR is 0.005 per $^\circ\text{C}$, at what temperature its resistance will become 200Ω ?	4	L3	CO5

OR

Q.10	a.	Describe the working principle of a superconducting nanowire single-photon detector.	7	L2	CO5
	b.	Explain the construction and working of phototransistor and mention its applications.	8	L2	CO5
	c.	A hall sensor is made from hall coefficient R_H of $3.66 \times 10^{-4} \text{ m}^3/\text{C}$. the sensor has a thickness of 0.5mm and is operated with a constant bias current of 5.1 mA. Calculate the voltage sensitivity of the sensors and if the sensor is placed in a magnetic field with a flux density of 500 G what will be the hall voltage.	5	L3	CO5

* * * * *

--	--	--	--	--	--	--	--	--	--

Third Semester B.E./B.Tech. Degree Examination, June / July 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.	What are Combinational Circuits? Explain combinational circuits with block diagram.	04	L2	CO1
	b.	Develop minimal expression using K – map for the following incompletely specified function. $f(a, b, c, d) = \sum m(0, 1, 4, 6, 7, 9, 15) + \sum d(3, 5, 11, 13)$ and draw the circuit diagram using basic gates.	06	L3	CO1
	c.	Define canonical form representation and solve the following equation using canonical form. i) $D = f(a, b, c) = ab^1 + ac^1 + bc$ ii) $K = f(w, x, y, z) = w^1x + yz^1$.	10	L3	CO1
OR					
Q.2	a.	Define K – map, solve the following using K – map i) $K = f(w, x, y, z) = \sum m(0, 1, 4, 5, 9, 11, 13, 15)$ ii) $D = f(a, b, c, d) = \sum m(0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14)$	10	L3	CO1
	b.	Develop all the prime implicants of the following Boolean function using Quine – Mecluskey method. $f(a, b, c, d) = \sum(0, 2, 3, 5, 8, 10, 11)$. Verify the result using K –map technique.	10	L3	CO1
Module – 2					
Q.3	a.	Explain binary Adder's with K – map and logical representation of equations for SUM and CARRY.	06	L2	CO2
	b.	Explain Look – Ahead carry adder with neat diagram and relevant expression.	06	L2	CO2
	c.	A combinational circuit is defined by the functions $f_1 = \sum m(3, 5, 7)$, $f_2 = \sum m(4, 5, 7)$. Implement the circuit with a programmable logic array having 3 inputs, 3 product terms and 2 outputs.	08	L3	CO2
OR					
Q.4	a.	Draw the circuit for 3 to 8 decoder and explain.	06	L2	CO2
	b.	Design 2 – bit comparator using gates.	06	L2	CO2
	c.	Implement $D = (w, x, y, z) = \sum m(0, 1, 2, 4, 5, 7, 8, 9, 12, 13)$ using 8:1 MUX.	08	L3	CO2

BEC302					
Module – 3					
Q.5	a.	Draw and explain the logic diagram, functional table and timing diagram of master – slave JK flip flop.	10	L2	CO3
	b.	Explain 4 – bit binary ripple counter with logic diagram and timing diagram.	10	L2	CO3
OR					
Q.6	a.	Develop characteristic equation for S – R and T flip flops with the help of function table and explain.	06	L3	CO3
	b.	What are Registers? Explain any two classification of Data Movement registers with neat block diagram.	06	L2	CO3
	c.	Design Synchronous MOD – 6 counter using clocked JK flip flops for sequences: 0 – 2 – 3 – 6 – 5 – 1	08	L3	CO3
Module – 4					
Q.7	a.	Describe different styles of HDL descriptions with an example for each.	08	L2	CO4
	b.	Write Verilog code for full Adder using dataflow description.	06	L2	CO4
	c.	Write a note on Arithmetic and shift, operators with example.	06	L2	CO4
OR					
Q.8	a.	Define HDL and types of HDL. Give structure of verilog module with example.	06	L2	CO4
	b.	Explain Verilog logical operators with example.	06	L2	CO4
	c.	i) Write a note an Verilog Data type ii) Write a Verilog code for 8×1 MUX	08	L2	CO4
Module – 5					
Q.9	a.	Write a Verilog code for 2×1 MUX using ELSE STATEMENT.	06	L2	CO5
	b.	Explain structural description with an example.	08	L2	CO5
	c.	Write a structural description of 3 – bit ripple carry adder.	06	L2	CO5
OR					
Q.10	a.	Write a note on Structure of Behavioural Description with an example.	08	L2	CO5
	b.	Write a note on Signal Assignment and Variable Assignment with an example.	06	L2	CO5
	c.	Write a note on sequential statement with an example.	06	L2	CO5

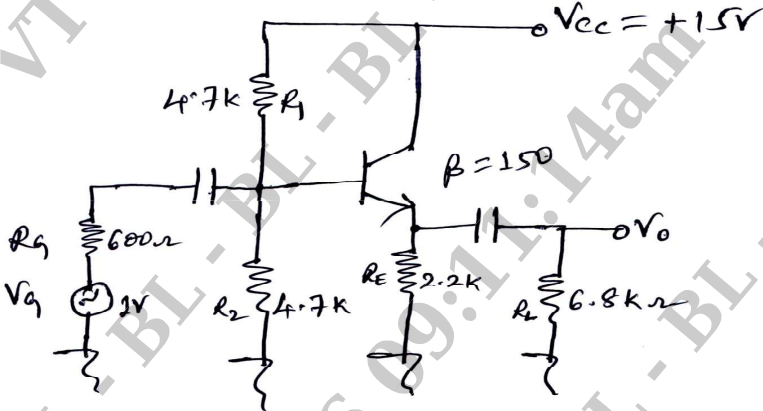
Third Semester B.E./B.Tech. Degree Examination, June/July 2026

Electronic Principles and Circuits

Time: 3 hrs.

Max. Marks: 100

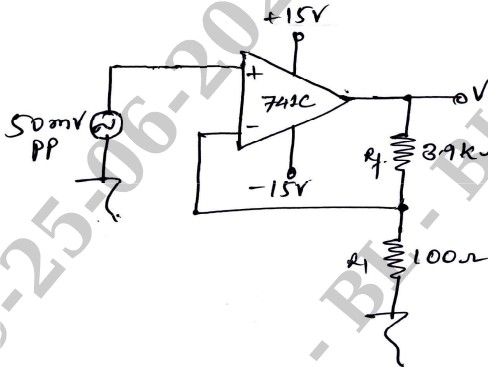
*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Analyze the CE-Amplifier with the help of DC circuit and AC equivalent circuit using π - model. Write the expressions for DC terminal voltages and transistor currents.	10	L2	CO1
	b.	Discuss about DC load line and Q-point for a VDB circuit.	05	L2	CO1
	c.	Discuss Two-Models of BJT.	05	L2	CO1
OR					
Q.2	a.	Explain Two-Supply Emitter – Bias (TSEB) Amplifier with the help of circuit and waveforms.	10	L2	CO1
	b.	Calculate voltage gain, input impedance of the base and stage and ac input and ac output voltage for a given circuit of Fig.Q2(b).	10	L3	CO1
 Fig.Q2(b)					
Module – 2					
Q.3	a.	Explain voltage divider biasing method in MOSFET by fixing V_G and connecting degeneration resistance in the source.	07	L2	CO2
	b.	Derive the equation for the ac drain current and the voltage gain for small-signal MOSFET Amplifier.	07	L2	CO2
	c.	Draw and explain the basic structure of MOS-Amplifier to implement the various configurations.	06	L2	CO1
OR					
Q.4	a.	Derive an equation for the overall voltage gain and amplifier output resistance for CS-Amplifier with the help of necessary diagrams.	10	L2	CO2
	b.	Develop the necessary expressions for source-follower amplifier with the help of amplifier circuit and its small signal equivalent circuit model.	10	L2	CO2
Module – 3					
Q.5	a.	Explain how the op-amp can be used as a summing amplifier? Justify with the help of circuit diagram and expressions.	10	L2	CO3
	b.	Design 4-bit R/2R ladder D/A converter with an example. Find the analog output voltage for a 4-bit binary input $D_3D_2D_1D_0 = (1011)_2$.	10	L3	CO3

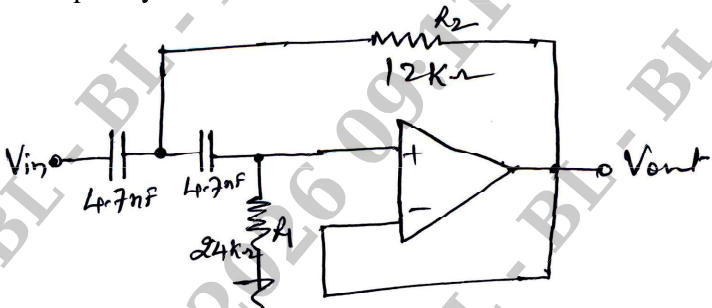
OR

Q.6	a.	Describe the working of Colpitt's crystal oscillator with the help of circuit diagram.	06	L2	CO3
	b.	Discuss the operation of Monostable and Astable using 555-timer.	06	L2	CO3
	c.	Plot the transfer characteristics of a comparator with positive and negative threshold voltages with the help of diagrams.	08	L2	CO3

Module – 4

Q.7	a.	Explain the VCIS – Amplifier. Obtain the expressions for exact output current, closed-loop input and output impedances.	08	L2	CO4
	b.	Calculate the feedback fraction, the ideal closed-loop voltage gain, the % error and the exact closed loop voltage gain for a given circuit of Fig.Q7(b). Use a typical A_{VOL} of 100,000 for the 741C.	08	L3	CO4
 Fig.Q7(b)			04	L2	CO4
	c.	Explain VCVS and ICIS Negative Feedback Amplifiers.	04	L2	CO4

OR

Q.8	a.	Explain the ideal response of LPF, HPF and BPF.	06	L2	CO4
	b.	What are the pole frequency and Q of the filter shown in Fig.Q8(b)? What is the cutoff frequency of the same?	06	L3	CO4
 Fig.Q8(b)			08	L2	CO4
	c.	Explain MFB Bandpass filters with the help of necessary diagrams and expressions.	08	L2	CO4

Module – 5

Q.9	a.	Explain Class-A power amplifier operation with the help of circuit diagram. Derive the equations for power gain, output power and efficiency.	08	L2	CO5
	b.	Explain Class-B push-pull emitter follower with the help of circuit diagram.	06	L2	CO5
	c.	Explain Tuned Class-C Amplifier operation with the help of necessary diagrams.	06	L2	CO5

OR

Q.10	a.	Explain the SCR operation with the help of Basic SCR circuit.	06	L2	CO5
	b.	Explain the operation of Diac and Triac with the help of necessary diagrams.	08	L2	CO5
	c.	Draw the circuit diagram of UJT relaxation oscillator and explain its operation.	06	L2	CO5

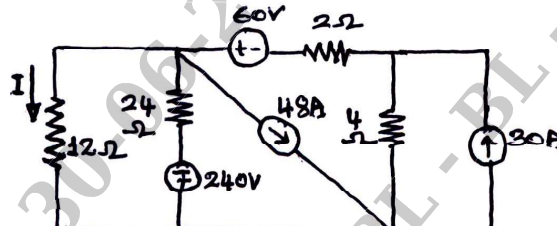
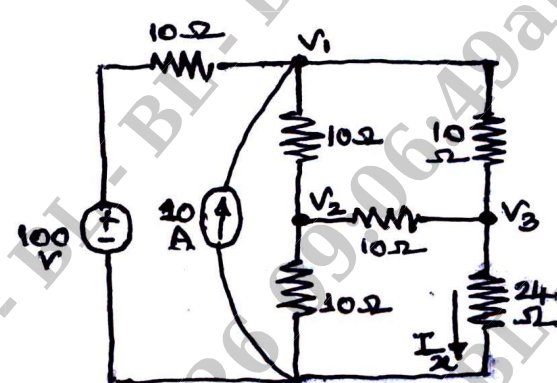
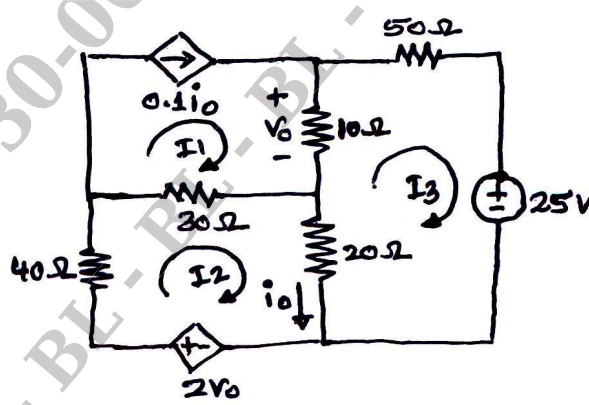
Third Semester B.E./B.Tech. Degree Examination, June/July 2026

Network Analysis

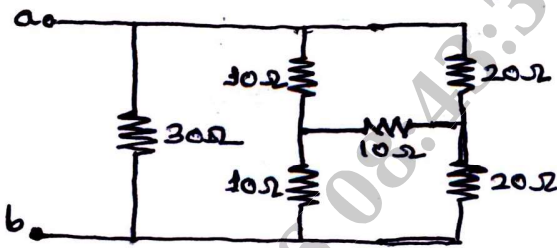
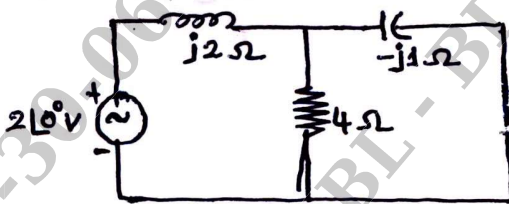
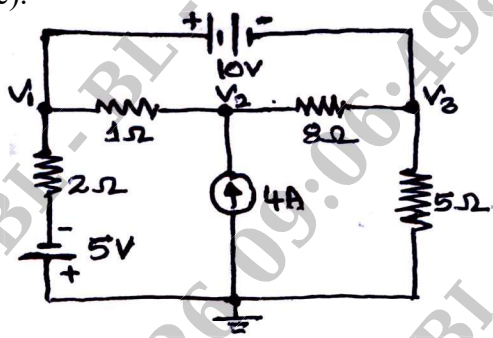
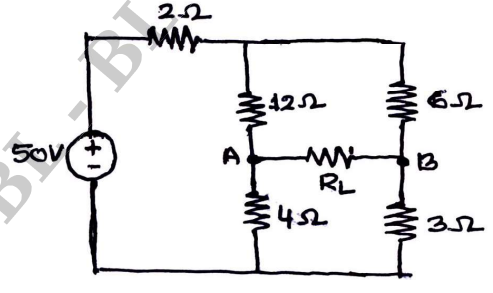
Time: 3 hrs.

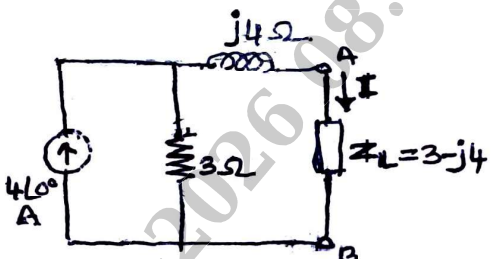
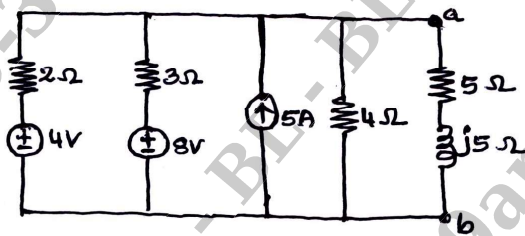
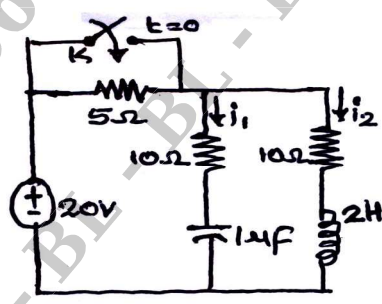
Max. Marks: 100

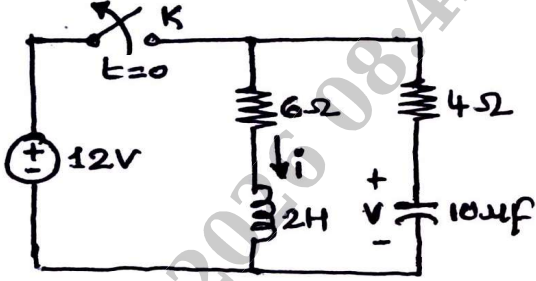
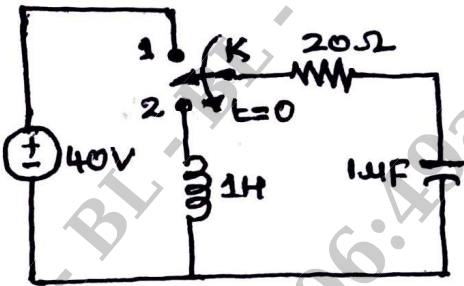
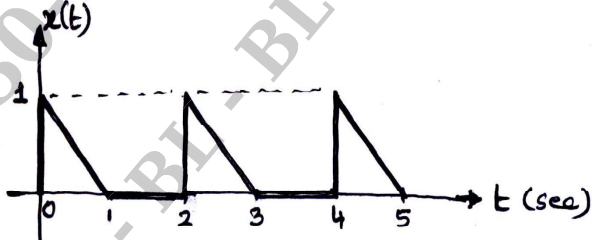
*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

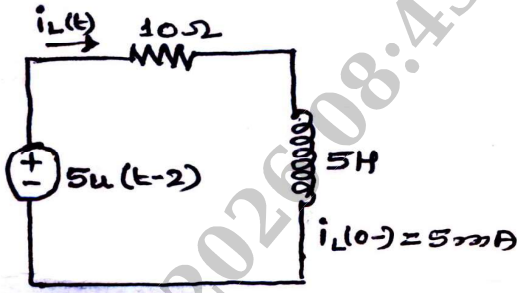
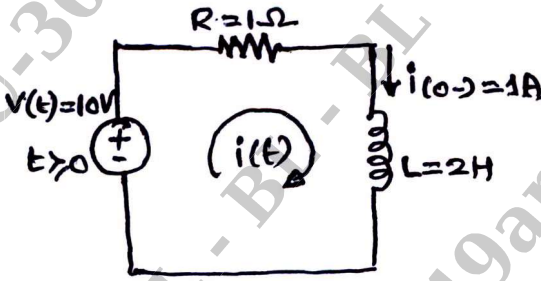
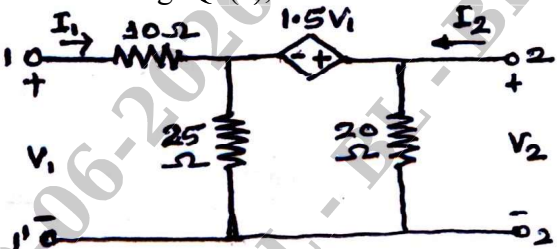
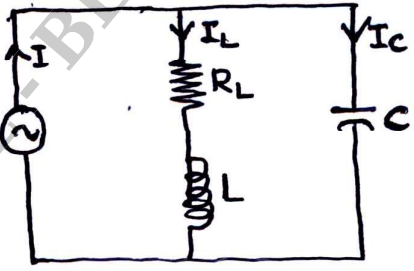
Module - 1			M	L	C
Q.1	a.	In the circuit shown in Fig. Q1(a), determine the current through 12Ω resistor using source transformation method.  Fig. Q1(a)	6	L2	CO1
	b.	Refer the circuit shown in Fig. Q1(b). Determine all node voltages and current I_x .  Fig. Q1(b)	7	L3	CO1
	c.	In the circuit shown in Fig. Q1(c), find the value of ' V_o ', ' I_o ' and also all loop current using mesh analysis.  Fig. Q1(c)	7	L3	CO1

OR

Q.2	a. Determine the equivalent resistance between terminal a – b , for the network shown in Fig. Q2(a), using Star – Delta transformation.  Fig. Q2(a)	6	L2	CO1
	b. Refer to network shown in Fig.Q2(b), determine loop current using Cramer's method.  Fig. Q2(b)	7	L3	CO1
	c. Using super node concept, determine all node voltages for the network shown in Fig. Q2(c).  Fig. Q2(c)	7	L3	CO1
Module – 2				
Q.3	a. State the following theorems : i) Super position theorem ii) Norton's theorem. And procedure to evaluate the same.	6	L2	CO2
	b. Refer to the network shown in Fig. Q3(b), find Thevenin's equivalent external to terminal A – B.  Fig. Q3(b)	7	L3	CO2

	c.	Refer to the network shown in Fig. Q3(b), find the value of R_L for which maximum power is delivered using Maximum power transfer theorem.	7	L3	CO2
OR					
Q.4	a.	Find current 'I' using Norton's theorem for the Network shown in Fig. Q4(a). 	7	L3	CO2
	b.	Refer to the circuit shown in Fig. Q4(b), using Millman's Theorem, find current through $(5 + j5)\Omega$. 	7	L3	CO2
	c.	State and prove maximum Power transfer theorem for DC circuits.	6	L3	CO2
Module – 3					
Q.5	a.	Enlighten the behavior of R, L and C components at $t = 0^+$ and $t = \infty$ with necessary proof.	5	L2	CO3
	b.	Refer to the circuit shown in Fig. Q5(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 $t = 0^+$. 	10	L3	CO3
	c.	Describe the significance of initial condition theory with suitable example.	5	L2	CO3
OR					

Q.6	a. For the circuit shown in Fig. Q6(a). Find the following : i) $i(0+)$ and $V(0+)$ ii) $\frac{di(0+)}{dt}$ and $\frac{dV(0+)}{dt}$.  Fig. Q6(a)	10	L3	CO3
	b. Refer network shown in Fig. Q6(b). The switch 'K' is moved from position 1 to position 2 at $t = 0$. The steady state has been reached before switching. Calculate i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0+$.  Fig. Q6(b)	10	L3	CO3
Module – 4				
Q.7	a. Explain three important singularity functions and sketch the function and its mathematical definition.	5	L1	CO3
	b. Prove the following Laplace transform properties : i) Linearity ii) Time shifting.	7	L2	CO3
	c. Find the Laplace transform of periodic signal $x(t)$ shown in Fig. Q7(c).  Fig. Q7(c)	8	L3	CO3
OR				

Q.8	a. Refer to the RL circuit shown in Fig. Q8(a). i) Write a differentiate equation for the inductor current $i_L(t)$. ii) Find $I_L(s)$, the Laplace transform of $i_L(t)$ iii) Solve for $i_L(t)$.  Fig. Q8(a)	8	L3	CO3
	b. For the circuit shown in Fig. Q8(b), find $i(0)$ and $i(\infty)$ using initial and final value theorem.  Fig. Q8(b)	8	L3	CO3
	c. Find the Laplace transform of Fundamental signals step, Ramp and Impulse.	4	L1	CO3
Module – 5				
Q.9	a. For the network shown in Fig. Q9(a), determine short circuit parameters.  Fig. Q9(a)	10	L2	CO4
	b. Derive the resonant frequency "f_r" of network shown in Fig. Q9(b).  Fig. Q9(b)	6	L3	CO5

	c.	Define the following terms : i) Selectivity ii) Quality factor iii) Half power frequencies iv) Bandwidth.	4	L1	CO5
OR					
Q.10	a.	Derive an expression for h – parameters in terms of Y – parameters and calculate h – parameters using results of Q9(a).	10	L4	CO4
	b.	Two coils, one of $R_1 = 0.51\Omega$, $L_1 = 32\text{mH}$, the other of $R_2 = 1.3\Omega$ and $L_2 = 15\text{mH}$ and two capacitors of $25\mu\text{F}$ and $62\mu\text{F}$ are all in series with a resistance of 0.24Ω . Determine the following for the circuit with supply voltage of 20V . i) Resonance frequency ' f_0 ' ii) Q of each coil iii) Q of circuit iv) Bandwidth v) Current at resonance vi) Half power frequencies f_1 and f_2 .	10	L3	CO5

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

BEC306C

Third Semester B.E./B.Tech. Degree Examination, June/July 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 block diagram, explain basic operational concept of computer.	10	L2	CO1
	b.	Explain Big-Endian and Little-Endian with neat diagram.	06	L2	CO1
	c.	Explain computer basic performance equation.	04	L2	CO1
OR					
Q.2	a.	Illustrate Instruction and Instruction Sequencing with an example.	10	L2	CO1
	b.	What is Operating System? Explain user program and OS routine sharing the processor.	05	L2	CO1
	c.	Explain the bus structures.	05	L2	CO1
Module – 2					
Q.3	a.	What is an addressing mode? Explain any five types of addressing modes with example.	10	L2	CO2
	b.	Explain subroutine linkage with an example using linkage register.	06	L2	CO2
	c.	Explain memory operations with examples.	04	L2	CO2
OR					
Q.4	a.	What are Assembler Directives? Explain any five assembler directives.	10	L2	CO2
	b.	Explain stack operation with an example.	10	L2	CO2
Module – 3					
Q.5	a.	Define Interrupt. Explain the various ways of enabling and disabling interrupts.	10	L2	CO3
	b.	Explain the registers involved in a DMA interface, to illustrate DMA.	05	L2	CO3
	c.	Explain the concept of Vectored Interrupt.	05	L2	CO3
1 of 2					

OR

Q.6	a.	Explain program controlled input/output, with the possible register configuration in I/O interface.	10	L2	CO3
	b.	Explain the following methods of handling interrupts from multiple devices: (i) Daisy chain method (ii) Priority structure	10	L2	CO3

Module – 4

Q.7	a.	With a neat diagram, explain Internal Organization of $2M \times 8$ dynamic memory chip.	10	L2	CO4
	b.	Describe the principles of magnetic disk.	05	L2	CO4
	c.	Explain virtual memory organization with diagram.	05	L2	CO4

OR

Q.8	a.	Illustrate Internal structure of static memories.	10	L2	CO4
	b.	Discuss a single-transistor dynamic memory cell.	05	L2	CO4
	c.	Briefly explain any four non-volatile memory concepts.	05	L2	CO4

Module – 5

Q.9	a.	Explain the three-bus organization of the processor and its advantages.	10	L2	CO5
	b.	What are the action required to execute a complete instruction ADD (R_3), R_1	10	L2	CO5

OR

Q.10	a.	With a block diagram, describe the organization of a micro programmed control unit.	10	L2	CO5
	b.	Discuss with neat diagram, the single bus organization of data path inside a processor.	10	L2	CO5

--	--	--	--	--	--	--	--	--	--

Third Semester B.E./B.Tech. Degree Examination, June/July 2026

MATLAB Programming

Time: 2 hrs.

Max. Marks: 50

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 MATLAB. With a neat schematic diagram, explain main features of MATLAB.	05	L2	CO1
	b.	Write a MATLAB command to find sum of geometric series $1 + r + r^2 + \dots + r^n = \frac{1}{1-r}$ for $r < 1$. Create a vector n of 11 elements from 0 to 10, take $r = 0.5$. Also create a vector n from 0 to 50 and from 0 to 100.	05	L2	CO1
OR					
Q.2	a.	Explain various file types used in MATLAB.	05	L2	CO1
	b.	Write a MATLAB command to compute point on a circle with radius r, where $r^2 = x^2 + y^2$. Create a column vector for θ with the values $0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \pi$ and $\frac{5\pi}{4}$, take $r = 2$.	05	L2	CO1
Module – 2					
Q.3	a.	Explain the steps involved in creating and executing a function file in MATLAB with example.	05	L2	CO2
	b.	Write a MATLAB program to plot a circle of arbitrary radius r.	05	L2	CO2
OR					
Q.4	a.	Define script file. Explain how to create, write and save a script file in MATLAB.	05	L2	CO2
	b.	Write a MATLAB command to perform the following: i) Create 3×3 matrix A ii) Create a submatrix B of 2×3 iii) Correct the third row, third column entry to 6 iv) Find the transpose of a first row of matrix A and $x \cdot x^T$ v) Multiply the matrix x with a vector and exponentiation the matrix A.	05	L2	CO2
Module – 3					
Q.5	a.	Define Anonymous function with example. Explain its syntax.	05	L2	CO3
	b.	Write a MATLAB code to solve the two simultaneous algebraic equations for x and y: $ax + by - 3 = 0$ $-x + 2ay - 5 = 0$. Check the result by substituting in expression 1 and get the expression in more readable form using built-in command.	05	L2	CO3

OR					
Q.6	a.	Explain the three different kinds of files for reading data into MATLAB's workspace with example.	05	L2	CO3
	b.	Write a MATLAB program to: i) Create an anonymous function $f(x) = x^3 - 3x^2 + x \log(x-1) + 100$ ii) Evaluate the function at $x = 0$ and $x = 1$ iii) Use function f in an array iv) Redefine f by vectorizing the expression using array operators v) Plot the function $f(x)$	05	L2	CO3
Module – 4					
Q.7	a.	Explain 'eval' function with an example.	05	L2	CO4
	b.	Write a MATLAB program to: i) Create a simple inline function $F(x) = x^2 - \sin(x)$ and compute its value at $x = \pi$ ii) Modify $F(x)$ using array operators and evaluate $F(x)$ when x is a vector iii) Create an inline function $F(x, y)$ of two variables. Check its symmetry by evaluating $F(x, y)$ at $(1, 2)$ and $(2, 1)$	05	L2	CO4
OR					
Q.8	a.	Explain the steps in creating vector with example.	05	L2	CO4
	b.	Write a MATLAB command to: i) Create a matrix A of 3×3 ii) To find eigen values of matrix A iii) To find eigen vector of matrix A	05	L2	CO4
Module – 5					
Q.9	a.	Describe the anatomy of function file in MATLAB with an example.	05	L2	CO4
	b.	Write a MATLAB program to solve first order ODE (Ordinary Differential Equation) $\dot{x} = Kx + C \sin t$, $x(0) = 1.0$	05	L3	CO4
OR					
Q.10	a.	Explain the MATLAB control flow statements: i) Switch –case ii) Break iii) Return	06	L2	CO4
	b.	Write a MATLAB program to compute n^{th} term of Fibonacci using recursive function.	04	L3	CO4

Fourth Semester B.E./B.Tech. Degree Examination, June / July 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.	Transform the vector field, to spherical co-ordinates. i) $10a_{\hat{x}}$ at $p(x = -3, y = 2, z = 4)$ ii) $10a_{\hat{y}}$ at $Q(r = 5, \phi = 30^\circ, z = 4)$	06	L3	CO1
	b.	State and explain Coulomb's law of force between two point charges in vector form.	06	L2	CO1
	c.	Point charges of 50 nC each located at A (1, 0, 0) , B (-1, 0, 0), C (0,1,0) and D (0, -1, 0) in free space . Find total force on the charge at A.	08	L3	CO1
OR					
Q.2	a.	Derive an expression for electric field intensity due to Infinite line charge.	08	L2	CO1
	b.	A uniform line charge of 16 nC/m is located along the line defined by $y = -2, z = 5$. Find $\vec{E}$ at $P(1,2,3)$	06	L3	CO1
	c.	Three infinite uniform sheets of charge are located in free space as follows $\rho_{s1} = 3 \text{ nc/m}^2$ at $z = -4$, $\rho_{s2} = 6 \text{ nc/m}^2$ at $z = 1$ and $\rho_{s3} = -8 \text{ nc/m}^2$ at $z = 4$. Find $\vec{E}$ at the point i) $P_A (-1, -5, 2)$ ii) $P_B (-2, 4, 5)$	06	L3	CO1
Module – 2					
Q.3	a.	State and prove Gauss's law for point charge.	06	L2	CO2
	b.	Given $\vec{D} = 0.3r^2 \hat{a}_r \text{ nC/m}^2$ in free space. i) Find the total charge within the sphere $r = 3$ ii) Find the total flux leaving the sphere $r = 4$	06	L3	CO2
	c.	Obtain the expression for work done in moving a point charge in an electric field.	08	L2	CO2
OR					
Q.4	a.	Evaluate both sides of Divergence theorem for the field $\vec{D} = 2xya_{\hat{x}} + x^2a_{\hat{y}} \text{ C/m}^2$ and rectangular parallelopiped formed by planes $x = 0$ and $y = 0$ and $2z = 0$ and 3.	08	L3	CO2
	b.	Derive the expression for equation of continuity.	06	L2	CO2
	c.	Calculate work done in moving a 4C charge from B (1,0,0) to A (0,2,0) along the path $y = 2 - 2x, z = 0$ in the field $\vec{E} = 5xa_{\hat{x}} + 5ya_{\hat{y}} \text{ V/m}$.	06	L3	CO2

Module – 3

Q.5	a.	Derive the expression for Poisson's equation and Laplace's equation.	06	L2	CO3
	b.	Using Laplace's equation, derive the expression for capacitance per unit length of a co-axial cable using the following boundary condition $V = V_0$ at $r = R_1$ and $V = 0$ at $r = R_2$ and $R_2 > R_1$ where R_1 and R_2 are inner and outer radius of co-axial cable.	08	L3	CO3
	c.	State and prove Amper's Circuital Law.	06	L2	CO3

OR

Q.6	a.	Define stokes theorem and evaluate both sides of the stokes theorem for the field $\vec{H} = 6xy \hat{a}_x - 3y^2 \hat{a}_y$ A/m and the rectangular path around the region $2 \leq x \leq 5$, $-1 \leq y \leq 1$ and $z = 0$. Let the direction of $\vec{ds}$ be $\hat{a}_z$.	12	L3	CO3
	b.	Define Curl. Write Curl equation in various co-ordinate s / m	08	L2	CO3

Module – 4

Q.7	a.	Derive an expression for Lorentz force equation.	06	L2	CO4
	b.	A conductor 4 m long lies along the y – axis with a current of 10 A in the $\hat{a}_y$ direction. Find the force on the conductor if the field in the region is $\vec{B} = 0.005 \hat{a}_x$ Tesla.	06	L3	CO4
	c.	Find the magnetization in a magnetic material where i) $M = 1.8 \times 10^{-5}$ H/m and $ \vec{H} = 120$ A/m ii) $M_r = 22$, where there are 8.3×10^{28} atoms /m ³ and each atom has a dipole moment of 4.5×10^{-27} A m ² iii) $ \vec{B} = 300$ mT and $\chi_m = 15$	08	L3	CO4

OR

Q.8	a.	Obtain the expression for magnetic force between the differential current elements.	06	L2	CO4
	b.	If $\vec{B} = 0.05x \hat{a}_y$ Tesla in a material for which $X_m = 2.5$. Find i) M_r ii) μ iii) $\vec{H}$ iv) $\vec{M}$ v) $\vec{J}$ vi) $\vec{J}_b$	06	L2	CO1
	c.	Derive the expression for boundary conditions between the two magnetic materials.	08	L2	CO4

Module – 5

Q.9	a.	List and explain Maxwell's equations in point form and integral form.	08	L2	CO5
	b.	Derive expression for uniform plane wave for a free space.	08	L2	CO5
	c.	Find the frequency at which conduction current density and displacement current are equal in a medium with $\sigma = 2 \times 10^{-4}$ mho / m and $\epsilon_r = 81$	04	L3	CO5

OR

Q.10	a.	State and prove Poynting theorem.	10	L2	CO5
	b.	Let $\mu = 10^{-5}$ H/m $\epsilon = 4 \times 10^{-9}$ F/m and $\sigma = 0$ and $P_v = 0$. Determine 'K' so that each of the following pairs of fields satisfy Maxwell's equation. i) $\vec{D} = 2x \hat{a}_x - 3y \hat{a}_y + 4z \hat{a}_z$, $\vec{H} = Kx \hat{a}_x + 10y \hat{a}_y - 25z \hat{a}_z$ A/m ii) $\vec{E} = (20y - kt) \hat{a}_x$ V/m, $\vec{H} = (y + 2 \times 10^6 t) \hat{a}_z$ A/m	10	L2	CO5

--	--	--	--	--	--	--	--	--	--

Fourth Semester B.E./B.Tech. Degree Examination, June/July 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
Q.1	a.	Define Conditional probability. Obtain the Baye's rule.	6	L2	CO1
	b.	Define Mean, Auto-correlation and Auto covariance function of a random process. List the properties of auto correlation function.	8	L2	CO1
	c.	Find the expected value and the variance of a Bernoulli Random variable $P(X = x) = \begin{cases} 1 - P & x = 0 \\ P & x = 1 \\ 0 & \text{otherwise} \end{cases}$	6	L2	CO1
OR					
Q.2	a.	Define Cumulative distribution function. Describe its properties.	6	L1	CO1
	b.	Explain Central Limit theorem as applied to Gaussian random process.	8	L2	CO1
	c.	Write a suitable code to generate probability density function of Gaussian distribution function.	6	L2	CO1
Module – 2					
Q.3	a.	Define Amplitude Modulation. Obtain the AM signal and represent AM wave both in time and frequency domain.	8	L2	CO2
	b.	Explain the working of Lattice Modulator with neat waveform.	6	L2	CO2
	c.	An audio frequency signal $10 \sin 2\pi \times 500t$ is used to amplitude modulate a carrier of $50 \sin 2\pi \times 10^5t$. Assume the modulation index as 0.2. Determine : i) Sideband frequencies ii) Bandwidth required iii) Total power delivered to the load of 600Ω	6	L3	CO2
OR					
Q.4	a.	Explain the working of high level collector modulator with neat circuit diagram.	7	L2	CO2
	b.	With neat circuit diagram and waveform, explain the working of diode detector.	8	L2	CO2
	c.	Write a suitable code to generate an AM wave and to demodulation waveform and display its spectrum.	5	L2	CO2

Module – 3					
Q.5	a.	With neat diagram, explain the concept of FM with an IC voltage controlled oscillator.	7	L2	CO3
	b.	Explain the basic block diagram of PLL for demodulation of FM signal along with capture and lock range.	8	L2	CO3
	c.	The input to an FM receiver has 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) Improved output S/N	5	L3	CO3
OR					
Q.6	a.	Describe the principle of frequency and phase modulation with relevant waveform.	7	L2	CO3
	b.	With neat diagram, explain the principle of Operation of super heterodyne receiver.	8	L2	CO3
	c.	Write a suitable code for generation and demodulation of FM wave and display its spectrum.	5	L3	CO3
Module – 4					
Q.7	a.	Explain the sampling process with mathematical expression and sketch the waveform for various sampling frequencies.	7	L2	CO4
	b.	With neat block diagram, explain the process of generation of pulse code modulation signal.	8	L2	CO4
	c.	Write a suitable code to generate raised cosine pulse signal.	5	L3	CO5
OR					
Q.8	a.	Explain the concept of Time Division multiplexing with block diagram.	8	L2	CO4
	b.	Explain the generation of pulse position modulation with neat waveform.	7	L2	CO4
	c.	Draw the line code waveform for a given data [01101001] i) Unipolar NRZ ii) Polar NRZ iii) Unipolar RZ iv) Bipolar RZ v) Manchester code.	5	L3	CO4
Module – 5					
Q.9	a.	State and explain the Nyquist criteria for distortion less baseband transmission.	7	L2	CO5
	b.	Define Signal to Noise Ratio. Explain the different types of External and Internal noise.	8	L2	CO5
	c.	Develop a code to generate and plot eye diagram.	5	L3	CO5
OR					
Q.10	a.	Define Inter Symbol Interference. Outline baseband binary data transmission system with neat block diagram and equations.	8	L2	CO5
	b.	Explain the concept of noise in cascaded stages with a diagram. Write Friss formula and mention its term.	7	L2	CO5
	c.	A receiver with a 75Ω input resistance operates at a temperature of 31°C . The received signal is at 89MHz with a bandwidth of 6 MHz. The received signal voltage of $8.3\ \mu\text{V}$ is applied to an amplifier with a noise figure of 2.8dB. Find : i) Input noise power ii) Input signal power iii) S/N in decibels iv) Noise factor.	5	L3	CO5

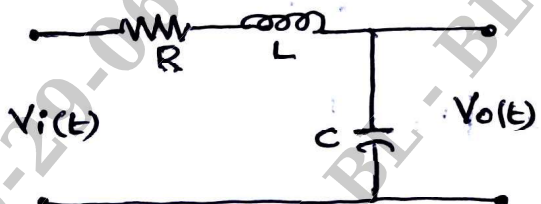
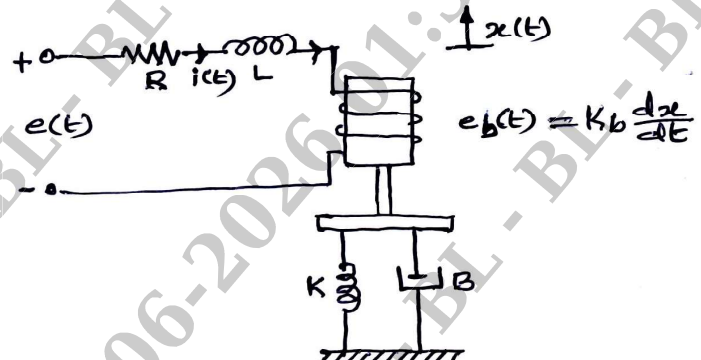
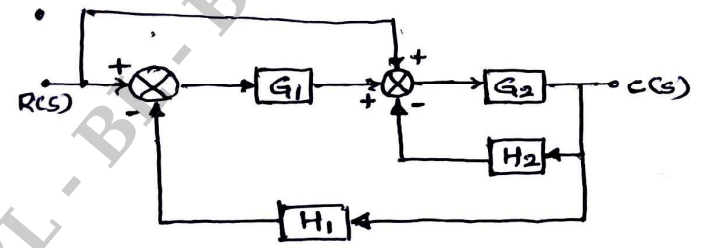
Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026

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.	Sketch the block diagram of closed loop control system and explain with a suitable example. Also mention advantages and disadvantages.	10	L2	CO1
	b.	Determine the transfer function of the system shown in Fig.Q1(b).  Fig.Q1(b)	10	L3	CO1
OR					
Q.2	a.	Explain Force voltage and Force current analogy with necessary diagram/equations.	10	L2	CO1
	b.	Refer to electro-mechanical system shown in Fig.Q2(b). Determine the transfer function $X(s)/E(s)$.  Fig.Q2(b)	10	L3	CO1
Module – 2					
Q.3	a.	Obtain the transfer function $C(s)/R(s)$ for the block diagram shown in Fig.Q3(a), using block diagram reduction technique.  Fig.Q3(a)	10	L3	CO1

Q.3	b.	Obtain the transfer function of the control system shown in Fig.Q3(b), using signal flow graph.	10	L3	CO1
-----	----	---	----	----	-----

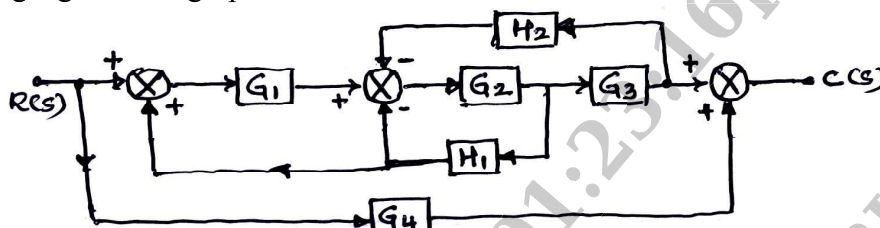


Fig.Q3(b)

OR

Q.4	a.	Obtain the overall transfer function C/R for the signal flow graph shown in Fig.Q4(a).	10	L3	CO1
-----	----	--	----	----	-----

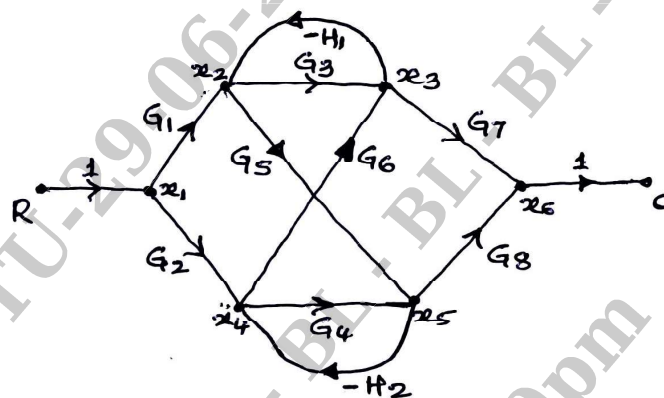


Fig.Q4(a)

	b.	Compare Block diagram and Signal flow graph.	05	L2	CO1
--	----	--	----	----	-----

	c.	Derive the transfer function of block diagram shown in Fig.Q4(c), using block diagram reduction technique.	05	L3	CO1
--	----	--	----	----	-----

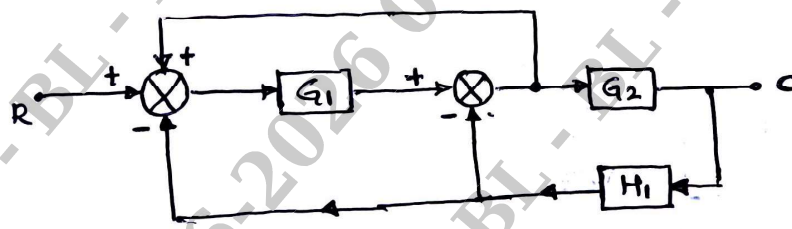


Fig.Q4(c)

Module – 3

Q.5	a.	Sketch the time response specification curve and deliberate on specification parameters.	07	L2	CO2
-----	----	--	----	----	-----

	b.	Obtain the response of unity feedback system, whose open loop transfer function is $G(s) = \frac{3}{s(s+4)}$ for a unit-step input.	07	L3	CO2
--	----	---	----	----	-----

	c.	The closed loop transfer functions of certain second order unity feedback control systems are given below. Determine the type of damping in the system.	06	L2	CO2
--	----	---	----	----	-----

(i) $\frac{C(s)}{R(s)} = \frac{8}{s^2 + 3s + 8}$ (ii) $\frac{C(s)}{R(s)} = \frac{2}{s^2 + 4s + 2}$ (iii) $\frac{C(s)}{R(s)} = \frac{2}{s^2 + 4}$

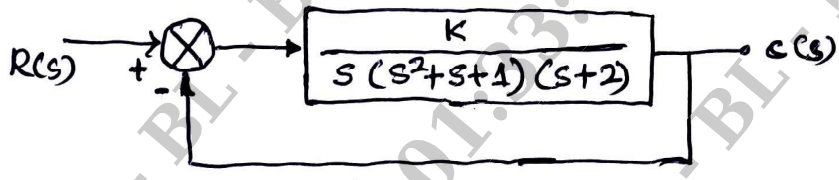
OR

Q.6	a.	Determine the nature of response of the closed loop system for unit step input. The open loop transfer function of unity feedback system is $4/s(s+1)$. Also find rise time, peak time, peak overshoot and settling time.	10	L3	CO2
	b.	Develop the transfer function first order system. And sketch the time response curve subjected to step-input and unit ramp.	10	L3	CO2

Module – 4

Q.7	a.	Examine the stability of characteristic equation $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 6 = 0$ using Routh's method.	08	L3	CO2
	b.	Sketch the root locus plot for a closed loop system having an open loop transfer function $G(s)H(s) = \frac{K(s+2)(s+1)}{s(s-1)}$ For all values of K ranging from 0 to ∞ . Find the range of values of K for closed loop stability.	12	L4	CO3

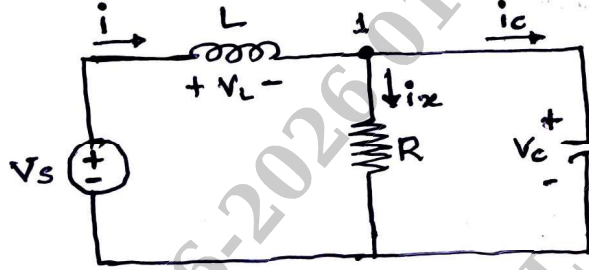
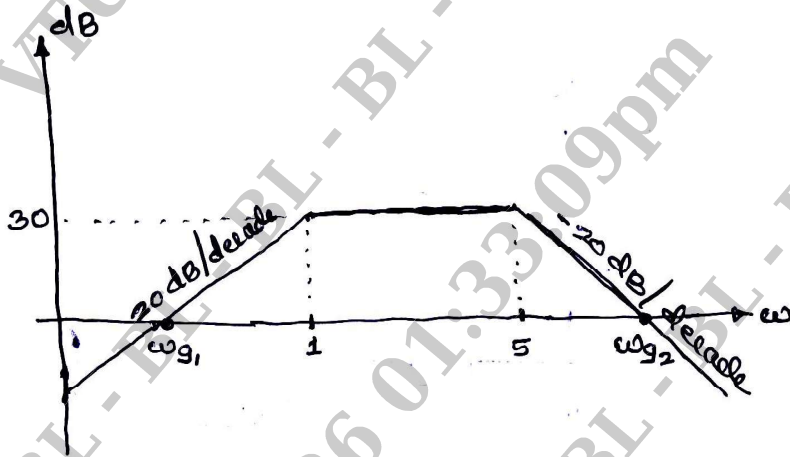
OR

Q.8	a.	Determine the value of 'K' for which the system is stable. The transfer function of system is as below Fig.Q8(a). 	08	L3	CO2
	b.	Sketch the root locus plot for a negative feedback control system characterized by $G(s)H(s) = \frac{K}{s(s^2 + 6s + 12)}$	12	L3	CO3

Module – 5

Q.9	a.	Using Nyquist stability criterion, investigate the stability of closed loop system, whose open loop transfer function is given by $G(s)H(s) = \frac{K}{(s+1)(s+2)}$	10	L3	CO4
	b.	Sketch the Bode plot for the forward path transfer function of unity feedback system given below. Also comment on stability. $G(s) = \frac{10e^{-0.1s}}{s(0.1s+1)^2}$	10	L3	CO4

OR

Q.10	a.	List and explain procedure for applying state variable method to electrical circuits. And also mention advantages of state space techniques.	07	L2	CO5
	b.	Find state space representation for the circuit shown in Fig.Q10(b). Take V_s as the input and i_x as the output.  Fig.Q10(b)	07	L2	CO5
	c.	Refer to the Bode plot shown in Fig.Q10(c). Find the open loop transfer function $G(s)H(s)$ and gain cross over frequencies ω_{g1} and ω_{g2} .  Fig.Q10(c)	06	L3	CO4

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

BEC405A

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026 Microcontrollers

Time: 3 hrs.

Max. Marks: 100

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

Module – 1			M	L	C
Q.1	a.	Mention the differences between Microprocessor and Microcontroller.	05	L1	CO1
	b.	Differentiate between CISC and RISC.	05	L1	CO1
	c.	With a neat diagram explain the 8051 architecture.	10	L2	CO1
OR					
Q.2	a.	With a neat diagram explain the 8051 RAM Structure.	10	L2	CO1
	b.	After Reset a 8051 Microcontroller what is the status of SFRs and GPRs.	05	L1	CO1
	c.	Explain the each bit of PSW register.	05	L1	CO1
Module – 2					
Q.3	a.	Define Addressing Mode. Explain the five types of 8051 addressing modes and provide example each.	12	L1	CO2
	b.	Write an ALP transfer 10 number of block of data from 30H to 40H.	08	L2	CO2
OR					
Q.4	a.	Explain the following instructions : (i) MOVX (ii) SWAP (iii) XCHD (iv) JBC (v) RETI	10	L2	CO2
	b.	Define Stack. Explain the operation of stack using stack pointer, PUSH and POP instructions.	10	L2	CO2
Module – 3					
Q.5	a.	Explain the following register : (i) TMOD (ii) TCON	10	L2	CO3
	b.	Illustrate an ALP to generate a square wave of frequency 1 KHz on P _{1.2} . Assume XTAL = 22 MHz.	10	L3	CO3
1 of 2					

OR

Q.6	a.	With a neat diagram explain the timer mode programming Mode 0, Mode 1 and Mode 2.	12	L2	CO3
	b.	Describe a 8051 C program transfer "VTU" serially at 9600 bps 8 bit data 1 start bit 1 stop bit, do this continuously.	08	L3	CO3

Module – 4

Q.7	a.	Explain the IE and IP registers.	10	L2	CO4
	b.	Explain interrupt vector table of 8051 microcontroller.	05	L2	CO4
	c.	Explain the bit status of SCON register.	05	L2	CO4

OR

Q.8	a.	Write a program to generate two square wave : One of 10 KHz frequency on P _{2.1} and another of 20 KHz at the P _{2.3} . Assume XTAL = 11.0592 MHz. Use T ₀ and T ₁ interrupt.	10	L3	CO4
	b.	List the steps involved in executing an interrupt.	10	L2	CO4

Module – 5

Q.9	a.	With a neat diagram write an ALP to interface stepper motor to 8051 microcontroller.	10	L2	CO5
	b.	Explain the 8051 DC motor interfacing.	10	L2	CO5

OR

Q.10	a.	With a neat diagram write an ALP to interface LCD to 8051 microcontroller.	10	L2	CO5
	b.	Write an 8051 C program to generate square wave and triangular wave.	10	L2	CO5

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21EC51

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026 Digital Communication

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With neat block diagram and signal space diagram, explain the generation and coherent detection of BPSK signal. (10 Marks)
- b. Binary data transmitted at a rate of 10^6 bps over a ℓ/w link. Assuming channel noise in AWGN with zero mean and PSD at the receiver input is $\left(\frac{N_0}{2}\right)$ i.e 10^{-10} W/Hz, find the average carrier power required to maintain an average probability of error $P_e \leq 10^{-4}$ for coherent binary PSK, Note $\text{erfc}(2.8) = 2 \times 10^{-4}$. (06 Marks)
- c. Define ASK and PSK with waveforms. (04 Marks)

OR

- 2 a. With neat block diagram, explain the generation and coherent detection of Binary frequency shift keying. (10 Marks)
- b. With neat block diagram and waveforms, explain the generation and coherent detection of QPSK. (10 Marks)

Module-2

- 3 a. Explain the geometric representation of signals, show that energy of the signals is equal to the squared length of the vector representing it. (10 Marks)
- b. Explain the gram-Schmitt orthogonalization procedure. (10 Marks)

OR

- 4 a. Using gram-Schmitt orthogonalization procedure, find the orthonormal basis functions for the set of given signals, Fig Q4(a).

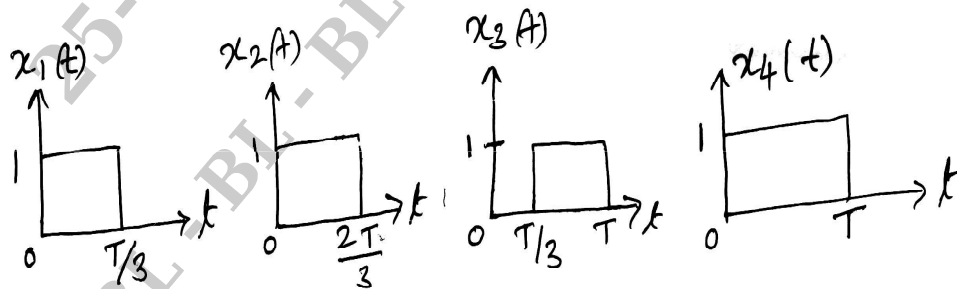


Fig Q4(a)

- b. With neat block diagram, explain briefly the base band binary data transmission system. (08 Marks)

Module-3

- 5 a. For the following maximum length sequence generator obtain the O/P sequence. Assume the initial state 100, Fig Q5(a)

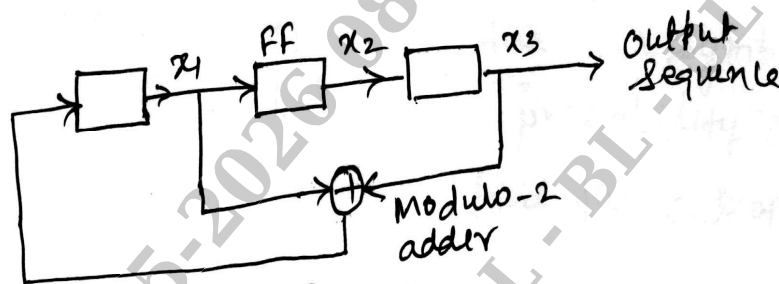


Fig Q5(a)

(06 Marks)

- b. Briefly, explain the properties of maximum length sequences. (06 Marks)
- c. Explain with a neat block diagram, the DS-spread coherent PSK transmitter and receiver. (08 Marks)

OR

- 6 a. What is meant by Frequency Hop Spread Spectrum? Briefly explain slow FH-SS with neat diagram. (10 Marks)
- b. Write a note on CDMA as a application of spread spectrum. (06 Marks)
- c. A PN sequence is generated using linear feedback shift register with number of stages equal to 10. The chip rate is $10^7/\text{sec}$. Find :
 i) PN sequence length
 ii) Chip duration of PN sequence
 iii) Period of the PN sequence (04 Marks)

Module-4

- 7 a. Define Entropy, state and prove any two properties of entropy. (06 Marks)
- b. A source emits one of the four symbols S_1, S_2, S_3 and S_4 with probability of $7/16, 5/16, 1/8$ and $1/8$. Find the entropy of this source and show that :
 $H(S^2) = 2 H(s)$ (10 Marks)
- c. Define :
 i) Self information ii) Entropy iii) Rate of information iv) Source efficiency. (04 Marks)

OR

- 8 a. A source emits an independent sequence of symbols from an alphabet consisting of five symbols A, B, C, D and E with probabilities of $\frac{1}{4}, \frac{1}{8}, \frac{1}{8}, \frac{3}{16}$ and $\frac{5}{16}$ respectively. Find the Shannon binary code for each symbol and efficiency of the coding scheme. (14 Marks)
- b. What is a Prefix Code? Explain with an example. (06 Marks)

Module-5

- 9 a. For Systematic (7, 4) Linear block codes. The parity matrix P is given by Fig Q9(a).
- Find the code words for the message bits 0101, 1110 and 0111
 - Draw the corresponding encoding circuit
 - A single error has occurred in the received vector $R_A = 0111110$ detect and correct the error

$$P = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

Fig Q9(a)

- b. What is meant by linear block codes and systematic codes? What is the error detection and correlation capabilities of linear block codes. (14 Marks)
- (06 Marks)

OR

- 10 a. For a (2, 1, 3) Convolution Encoder. Find the output sequence for the input message $d = 10111$, using Time domain approach for $g^{(1)} = 1011$, $g^{(2)} = 1111$. (10 Marks)
- b. Draw the state transition table, state diagram for (2, 1, 2) convolution encoder with impulse response. $g^{(1)} = 111$, $g^{(2)} = 101$ and input $d = [10111]$. (10 Marks)

* * * * *

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21EC52

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026 Computer Organization and ARM Microcontrollers

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Discuss operational concept in a computer highlighting role of PC, MAR, MDR and IR registers. (10 Marks)
- b. Write basic performance equation indicating role of each parameter in equation. (06 Marks)
- c. Explain how SPEC rating is computed for performance measurement and also mention overall SPEC rating for computer. (04 Marks)

OR

- 2 a. Explain I/O interface for input device and write a program that reads one line from keyboard stored in memory buffer and echoes it back to display. (08 Marks)
- b. Describe concept of interrupt in computer. (04 Marks)
- c. Explain 8-bit parallel interface circuit with diagram. (08 Marks)

Module-2

- 3 a. Describe the organization of $2m \times 8$ dynamic memory chip with diagram. (08 Marks)
- b. Explain different types of read only memories. (06 Marks)
- c. Describe different types of cache mapping techniques. (06 Marks)

OR

- 4 a. Discuss single bus organization of data path inside a processor. (08 Marks)
- b. Illustrate sequence required to execute the instruction Add (R_3), R_1 . (06 Marks)
- c. Sketch the micro-programmed control unit and branch < 0 write micro-routine for instruction. (06 Marks)

Module-3

- 5 a. Explain ARM based embedded device with diagram. (08 Marks)
 b. Describe RISC design philosophy with four design rules. (04 Marks)
 c. Discuss embedded system software with diagram. (08 Marks)

OR

- 6 a. Explain various functional unit of ARM with help of ARM core dataflow model. (10 Marks)
 b. Sketch basic layout of generic program status register and explain various fields. (10 Marks)

Module-4

- 7 a. Explain single register load-store index methods with example. (06 Marks)
 b. Discuss branch instructions and write a program for forward and backward branching. (08 Marks)
 c. Describe the following instruction with example :
 i) LSL ii) MOV iii) SWI. (06 Marks)

OR

- 8 a. Discuss different SWAP instruction with example. (06 Marks)
 b. Explain co-processor instructions of ARM processor. (06 Marks)
 c. Write an assembly language program to find sum of first 10 integer numbers. (08 Marks)

Module-5

- 9 a. Explain ARM Thumb internetworking with instructions. (08 Marks)
 b. Discuss stack instructions with example. (06 Marks)
 c. Describe the following instruction with example :
 i) ROR ii) MUN iii) BIC. (06 Marks)

OR

- 10 a. Explain why char data type should be avoided for local variables using code to find checksums of data packet containing 64 words. (10 Marks)
 b. Discuss loops using a variable number of iterations with example and show that do_while loop gives better performance and code density than for-loop. (10 Marks)

* * * * *

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21EC53

Fifth Semester B.E./B.Tech. Degree Examination, June / July 2026 Computer Communication Networks

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is physical topology? With a neat diagram explain the various types of physical topologies available in computer networks. (12 Marks)
- b. With neat diagram explain the significances of layers in TCP / IP protocol suite. (08 Marks)

OR

- 2 a. With a neat diagram explain the five components of data communication. (05 Marks)
- b. What is an ARP? Explain the operation of ARP and its packet format with suitable diagram. (10 Marks)
- c. Explain different data flow techniques used for communication between two devices. (05 Marks)

Module-2

- 3 a. Explain CSMA/CD working with the help of flow chart. (08 Marks)
- b. A slotted ALOHA network transmits 200 bit frames using shared channel with 200 kbps bandwidth. Find the throughput if the system produces
 - i) 1000 frames/second
 - ii) 500 frames/second
 - iii) 250 frames/second(06 Marks)
- c. Explain Ethernet frame format. (06 Marks)

OR

- 4 a. Describe the concept of bit stuffing and byte stuffing. (10 Marks)
- b. Explain CSMA and show the behavior of 3 persistence methods of CSMA. (06 Marks)
- c. Inspect the following MAC addresses as unicast, multicast and broadcast
 - i) 4A:30:10:21:10:1A
 - ii) 47:20:1B:2E:08:EE
 - iii) EF:FF:10:01:11:00
 - iv) FF:FF:FF:FF:FF:FF(04 Marks)

Module-3

- 5 a. Explain with a neat diagram the virtual circuit packet switched network and its various phases of operation. (12 Marks)
- b. Explain different classless IP addresses. (08 Marks)

OR

- 6 a. With suitable diagram explain distance vector routing. (10 Marks)
b. With neat diagram explain IPV4 datagram format. (10 Marks)

Module-4

- 7 a. Describe connectionless and connection oriented services provided by transport layer. (12 Marks)
b. Explain the working of Go back N protocol. (08 Marks)

OR

- 8 a. List the features of TCP. Explain TCP segment format with datagram. (10 Marks)
b. Explain UDP datagram format with services provided by UDP. (10 Marks)

Module-5

- 9 a. Explain persistent and non-persistent connections in HTTP. (10 Marks)
b. Explain the architecture of electronic mail with neat diagram. (10 Marks)

OR

- 10 a. Write a note on DNS recursive and iterative resolution. (10 Marks)
b. Explain security goals and types of attacks in network security. (10 Marks)

* * * * *

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21EC54

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026 Electromagnetic Waves

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. State and explain Coulomb's law in vector form. (06 Marks)
- b. Two point charges 20 nC and -20 nC are situated at (1, 0, 0) and (0, 1, 0) in free space. Determine Electric field intensity at (0, 0, 1). (08 Marks)
- c. Define Electric field intensity and Electric flux density. Also establish relationship between two. (06 Marks)

OR

- 2 a. A uniform charge of infinite length, $\rho_L = 20 \text{ nC/m}$ lies along Z – axis. Find Electric field intensity at point P(6, 8, 3) in air. (05 Marks)
- b. Calculate the total charge within the universe if volume charge distribution $\rho_v = \frac{e^{-2r}}{r^2} \text{ C/m}^3$. (08 Marks)
- c. Given Electric flux density $\vec{D} = 0.3r^2 \vec{a}_r \text{ nC/m}^2$:
 - i) Find Electric field intensity, $\vec{E}$ at P($r = 2\text{m}$, $\theta = 25^\circ$, $\phi = 90^\circ$)
 - ii) Find charge Q, within the sphere $r = 3$.
 - iii) Find total electric flux leaving the sphere $r = 4$. (07 Marks)

Module-2

- 3 a. Using Gauss law, derive an expression for Electric field intensity at a distant point due to infinite line charge. (08 Marks)
- b. Derive an expression for continuity of current. (06 Marks)
- c. Calculate numerical values for electric scalar potential 'V' and volume charge density ρ_v at a point P(1, 2, 3) in free space if $V = \frac{4YZ}{X^2 + 1}$. (06 Marks)

OR

- 4 a. Define Electric Scalar Potential. Derive an expression for potential due to point charge. (05 Marks)
- b. Given the flux density $\vec{D} = \frac{16}{r} \cos 2\theta \vec{R}_\theta \text{ C/m}^2$. Use two different methods to find total charge within the region $1 < r < 2 \text{ m}$, $1 < \theta < 2 \text{ rad}$, $1 < \phi < 2 \text{ rad}$. (08 Marks)
- c. Obtain an expression for the energy expended in moving a point charge in an electric field. (07 Marks)

Module-3

- 5 a. Derive Poisson's and Laplace's equation. (06 Marks)
- b. Evaluate both sides of Stoke's theorem for the field $H = 10 \sin \theta \vec{a}_\theta$ and the surface $r = 3$, $0 \leq \theta \leq 90^\circ$, $0 \leq \phi \leq 90^\circ$. Let the surface has $\vec{a}_r$ direction. (08 Marks)
- c. State and explain Biot – Savart's law. (06 Marks)

OR

- 6 a. State and prove Uniqueness Theorem. (06 Marks)
- b. Using Laplace equation, determine capacitance of parallel plate capacitor. (08 Marks)
- c. State and explain Ampere's law. (06 Marks)

Module-4

- 7 a. A point charge of $Q = -1.2C$ has velocity $\vec{v} = (5\vec{a}_x + 2\vec{a}_y - 3\vec{a}_z) \text{ m/s}$. Find the force exerted on the charge if
 i) $\vec{E} = -18\vec{a}_x + 5\vec{a}_y - 10\vec{a}_z \text{ V/m}$ ii) $\vec{B} = -4\vec{a}_x + 4\vec{a}_y + 3\vec{a}_z \text{ T}$ (06 Marks)
- b. Discuss Magnetic boundary conditions at the interface between two different magnetic materials. (08 Marks)
- c. Obtain an expression for the force between differential current elements. (06 Marks)

OR

- 8 a. Given a ferrite material which we shall specify to be operating in a linear mode with $\vec{B} = 0.05 \text{ T}$. Let us assume $\mu_r = 50$. Calculate
 i) χ_m magnetic susceptibility.
 ii) M magnetization
 iii) H magnetic field intensity. (06 Marks)
- b. Define inductance and derive an expression for inductance of toroidal coil of 'N' turns and a current 'I'. (06 Marks)
- c. State and explain Faraday's law of Electromagnetic induction. (08 Marks)

Module-5

- 9 a. List Maxwell's equation in point and integral form. (08 Marks)
- b. What is Displacement Current? Derive Maxwell's equation in point form, from Ampere's law. (06 Marks)
- c. Discuss wave propagation in good conductors. (06 Marks)

OR

- 10 a. Obtain solution for the wave equation for uniform plane wave. (08 Marks)
- b. Define Skin effect or depth of penetration. (04 Marks)
- c. State and prove Poynting Theorem. (08 Marks)

* * * * *

--	--	--	--	--	--	--	--	--	--

Fifth Semester B.E./B.Tech. Degree Examination, June/July 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.	Determine the Power and Energy of the unit step sequence.	06	L2	CO1
	b.	The impulse response of a linear time-invariant system is $h(n) = [1, 2, 1, -1]$ Determine the response of the system to the input signal $x(n) = [1, 2, 2, 1]$	08	L3	CO1
	c.	Write a program to perform the following operations on : (i) Signal Addition (ii) Multiplication	06	L3	CO1
OR					
Q.2	a.	Define the following with an example linear system. Memoryless system and Causal system, Even and Odd signal, Periodic and Non-periodic signal.	10	L2	CO1
	b.	Discuss the advantages and limitations of Digital Signal Processing.	06	L2	CO1
	c.	Write a program to generate the following discrete time signals : (i) Unit Step Sequence (ii) Unit Sample Sequence	04	L3	CO1
Module – 2					
Q.3	a.	Mention the properties of Z-transform with equation.	07	L2	CO2
	b.	Interpret the process of frequency domain sampling and reconstruction of discrete time signals with necessary equations.	08	L3	CO2
	c.	Find the 4-point DFT of the sequence $x(n) = [1, 2, 2, 1]$ using matrix method.	05	L3	CO2
OR					
Q.4	a.	Find the circular convolution of the sequences $x_1(n) = [1, 2, 3, 1]$ and $x_2(n) = [4, 3, 2, 2]$ using time domain approach and verify the result using frequency domain approach.	10	L3	CO2
	b.	Write a program to compute N-point DFT and also plot its magnitude and phase spectrum.	06	L3	CO2
	c.	A 498 point DFT of a real sequence has following DFT sequences: $X(0) = 2$, $X(11) = 7 + j3$, $X(K_1) = -2.2 - j1.5$ $X(112) = 3 + j0.7$, $X(K_2) = -4.7 + j$, $X(249) = 2.9$ $X(309) = -4.7 - j1.9$, $X(K_3) = 3 - j0.7$, $X(412) = -2.2 + j1.5$, $X(K_4) = 7 - j3.1$ The other samples have '0' values. Find K_1, K_2, K_3, K_4 .	04	L3	CO2
Module – 3					
Q.5	a.	State and prove Parseval's theorem.	05	L2	CO3
	b.	Given $x(n) = [3, -1, 0, 1, 3, 8, 3, -3, 2, 7, 3]$ and $h(n) = [1, -1, 2]$. Use 5-point circular convolution. Find $y(n)$ using Overlap Add Method.	10	L3	CO3

Q.5	c.	If $x(n) = [1, 1/2, 1/4, 1/8]$. Find $y(n)$ if the DFT are related as $y(k) = W_4^{3k} X(k)$ using time shift property.	05	L3	CO3
OR					
Q.6	a.	State and prove circular frequency shift property.	05	L2	CO3
	b.	Find the DFT of $x(n) = [1, 2, 3, 4, 4, 3, 2, 1]$ using DIT-FFT Algorithm.	10	L3	CO3
	c.	Compute the 4-point DFT of $x(n) = [1, 0, 1, 0]$. Also find $y(n)$ if $y(k) = X((k-2))_4$.	05	L3	CO3
Module – 4					
Q.7	a.	A low pass filter is to be designed for a desired frequency response $H_d(e^{jw}) = H_d(w) = \begin{cases} e^{-j2w} & w \leq \pi/4 \\ 0 & \pi/4 \leq w \leq \pi \end{cases}$ Determine the filter coefficients $h_d(n)$ and $h(n)$ if rectangular window is used. Also find the frequency response $H(w)$ of the resulting FIR filter.	10	L3	CO4
	b.	Obtain the direct form and cascade form realization of $H(z) = \left(1 - \frac{1}{4}z^{-1} + \frac{3}{8}z^{-2}\right) \left(1 - \frac{1}{8}z^{-1} - \frac{1}{2}z^{-2}\right)$	10	L3	CO4
OR					
Q.8	a.	Design a low pass filter with a desired $H_d(e^{jw}) = \begin{cases} e^{-j3w} & -3\pi/4 \leq w \leq 3\pi/4 \\ 0 & 3\pi/4 \leq w \leq \pi \end{cases}$ Using hamming window with $N = 7$. Also obtain the frequency response.	10	L3	CO4
	b.	Realize the given system function in direct form and cascade form : $H(z) = 1 + 5z^{-1} + 6z^{-2}$	10	L3	CO4
Module – 5					
Q.9	a.	Given analog filter whose transfer function is $H(s) = \frac{10}{s+10}$ Convert it to digital filter transfer function. Assume $T = 0.01$ sec. Using BLT technique and also find difference equation.	10	L3	CO5
	b.	Realize the following digital filter in Direct form I and II : $H(z) = \frac{0.7 + 1.4z^{-1} + 0.7z^{-2} + 0.5z^{-3}}{1 + 1.3z^{-1} + 0.5z^{-2} + 0.7z^{-3} + 0.3z^{-4}}$	10	L3	CO5
OR					
Q.10	a.	Derive the Bilinear transformation used for converting analog filter into digital filter.	08	L2	CO5
	b.	A digital lowpass filter is required to meet the following specifications: (i) Monotonic pass band and stop band (ii) -3.01 dB cutoff frequency of 0.5π rad (iii) Stop band attenuation of at least 15 dB at 0.75π rad. Find the system function $H(z)$. Also find the difference equation realization. Verify the design for pass band and stop band attenuation.	12	L3	CO5

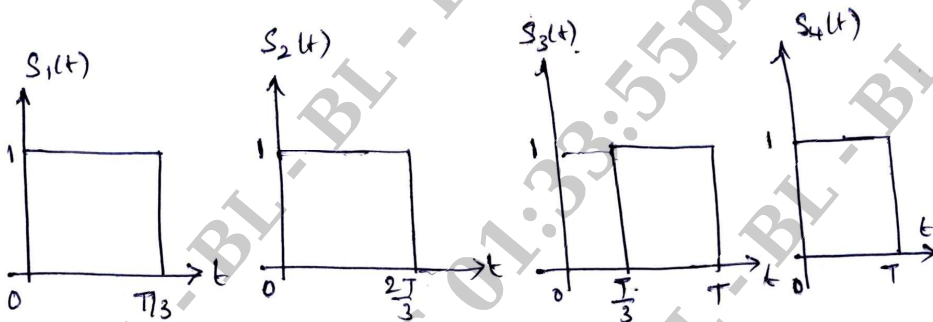
Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

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.*

Module – 1				M	L	C
Q.1	a.	Discuss the application of Hilbert Transform. Show that a signal $g(t)$ and its Hilbert transform $\hat{g}(t)$ are orthogonal over the entire time interval $(-\infty, +\infty)$	07	L2	CO1	
	b.	Define pre-envelope of a real valued signal. Given a bandpass signal $S(t)$, sketch the amplitude spectra of a signal $S(t)$, pre-envelope $S_t(t)$ and complex envelope $\tilde{S}(t)$.	07	L2	CO1	
	c.	With neat diagram discuss the synthesizer and analyser of generating and reconstruction of signal.	06	L3	CO1	
OR						
Q.2	a.	Consider the signal $S_1(t)$, $S_2(t)$ and $S_3(t)$ as given in Fig.Q2(a).  Fig.Q2(a) Evaluate an orthogonal basis for these set of signals using Gram-Schmidt orthogonalization. Also plot graph. Express each signals interms of basis functions.	15	L3	CO1	
	b.	Suppose $S_1(t)$, $S_2(t)$ and $S_3(t)$ are represented with reference to two orthogonal basis functions as given $S_1(t) = 3\phi_1(t)$; $S_2(t) = -2\phi_1(t) + 3\phi_2(t)$; $S_3(t) = -3\phi_1(t) - 3\phi_2(t)$ then construct the corresponding signal constellation diagram.	05	L3	CO2	
Module – 2						
Q.3	a.	With a block diagram, discuss coherent QPSK transmitter and receiver.	06	L3	CO2	
	b.	Describe the signal space representation for BPSK modulation. Obtain the expression for average probability of symbol error for BPSK using coherent detection.	10	L3	CO2	
	c.	Compute the constellation of QAM for $M = 16$ and draw the signal space diagram.	04	L2	CO2	

1 of 3

OR

Q.4	a.	A binary data stream is encoded using DPSK. Determine the encoded and decoded output for the sequence 1 1 0 1 0 0 0 1 1	04	L2	CO2
	b.	Illustrate the generation and detection of DPSK signal with neat diagram.	10	L2	CO2
	c.	Define Bandwidth Efficiency. Tabulate and comment on the bandwidth efficiency of M-ary PSK signals for different values of M.	06	L2	CO2

Module – 3

Q.5	a.	Outline the mutual information of the channel. Mention its properties and also define Channel Capacity.	08	L2	CO3
	b.	The output of an information source contains 160 symbols 128 of which occur with a probability of 1/256 and remaining with a probability of 1/64 each. Calculate the average information rate of the source if the source emits 10,000 sym/sec.	06	L2	CO3
	c.	Briefly explain Self Information, Entropy and Information Rate.	06	L2	CO3

OR

Q.6	a.	(i) Apply Huffman encoding procedure for the following set of messages and determine the efficiency of the binary code so formed. <table><tr><td>X₁</td><td>X₂</td><td>X₃</td></tr><tr><td>0.7</td><td>0.15</td><td>0.15</td></tr></table> (ii) If the same technique is applied to the 2nd order extension for the above message. How much will the efficiency be improved?	X ₁	X ₂	X ₃	0.7	0.15	0.15	12	L3	CO3
X ₁	X ₂	X ₃									
0.7	0.15	0.15									
	b.	Consider the following source $S = \{x_1, x_2, x_3, x_4, x_5, x_6\}$ with respective probabilities $P = \{0.4, 0.2, 0.2, 0.1, 0.07, 0.03\}$. Compute the code words for the symbols using Shannon's Fano encoding algorithm. Also find the code efficiency and redundancy.	08	L3	CO3						

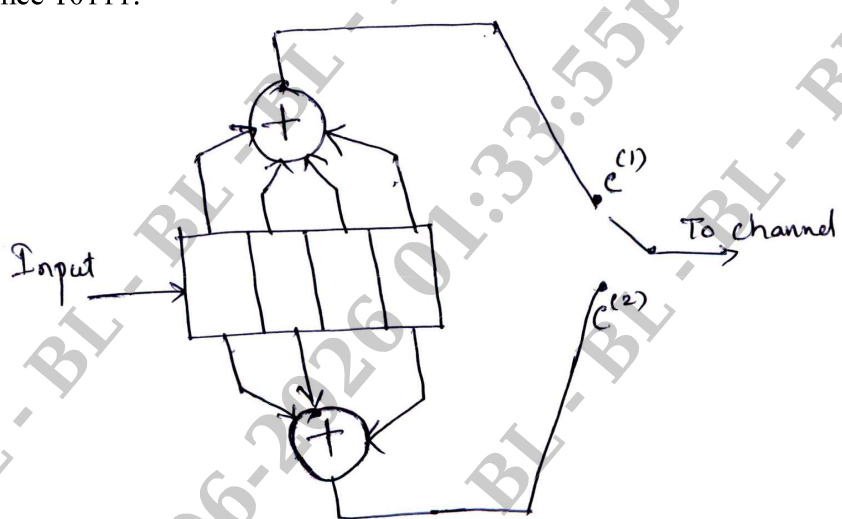
Module – 4

Q.7	a.	Indicate the advantages and disadvantages of Error Control Coding.	04	L2	CO4
	b.	For a systematic (6, 3) LBC the parity matrix P is given by $[P] = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ Obtain the possible code vector.	06	L2	CO4
	c.	Consider a (6, 3) LBC 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 the (i) all code vector (ii) Hamming weight and distance (iii) Minimum weight parity check matrix (iv) Draw the encoder circuit for the above codes.	10	L3	CO4

OR

Q.8	a.	Design an encoder circuit for (7, 4) binary cyclic code generated by $g(x) = 1 + x + x^3$ and verify its operation using message vector (1 0 0 1).	08	L3	CO4
	b.	A (15, 5) cyclic code has a generator polynomial $g(x) = 1 + x + x^2 + x^4 + x^5 + x^8 + x^{10}$ (i) Draw the block diagram of an encoder and syndrome calculator for this code. (ii) Express the code polynomial for the message polynomial $D(x) = 1 + x^2 + x^4$ in systematic form.	12	L3	CO4

Module – 5

Q.9	a.	Consider (3, 1, 2) convolution code with $g^{(1)} = (1\ 1\ 0)$; $g^{(2)} = (1\ 0\ 1)$ and $g^{(3)} = (1\ 1\ 1)$. (i) Draw the encoder block diagram (ii) Compute the generator matrix (iii) Represent the code word corresponding to the information sequence (1 1 1 0 1) using time domain and transfer domain approach.	14	L3	CO5
	b.	For the convolutional encoder shown in Fig.Q9(b) represent the impulse response and hence calculate the output produced by the information sequence 10111. 	06	L3	CO5

OR

Q.10		For a (3, 1, 2) convolutional encoder with $g^{(1)} = (1\ 1\ 0)$; $g^{(2)} = (1\ 0\ 1)$ and $g^{(3)} = (1\ 1\ 1)$ (i) Write state table (ii) Write the state transition table (iii) Draw state diagram and find the encoder output produced by the message sequence (1 1 1 0 1) by traversing through the state. (iv) Draw code tree and find the encoder output produced by the message sequence (1 1 1 0 1) by traversing through the code. (v) Draw code Trellis and obtain the output of the encoder for the same input sequence of (1 1 1 0 1).	20	L3	CO5
------	--	--	----	----	-----

USN

--	--	--	--	--	--	--	--	--	--

BEC515D

Fifth Semester B.E./B.Tech. Degree Examination, June/July 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.	Define the following : i) Orbit and trajectory ii) Ascending and descending nodes in an orbit iii) Apogee and perigee distance iv) Semimajor and semiminor axis v) Equinoxes.	10	L1	CO1	
	b.	Explain the different types of satellite orbits.	10	L2	CO1	
OR						
Q.2	a.	Explain three Keplers law of planetary motion.	10	L2	CO1	
	b.	Explain satellite spin stabilization technique employed for altitude control of a satellite.	6	L2	CO1	
	c.	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	L2	CO1	
Module – 2						
Q.3	a.	With a neat block schematic arrangement, explain a regulated bus power supply system also discuss types of power systems.	10	L2	CO2	
	b.	Explain Tracking Telemetry and Command Subsystem using a neat block schematic.	10	L2	CO2	
OR						
Q.4	a.	With a neat schematic, explain generalized earth station.	6	L2	CO2	
	b.	Explain Monopulse Satellite Tracking.	4	L2	CO2	
	c.	With neat sketch, explain different types of earth station antennas used in satellite communication.	10	L2	CO2	
Module – 3						
Q.5	a.	Define Transponder. Explain the types of transponder used in satellite.	10	L2	CO3	
	b.	Explain the advantages and disadvantages of satellite network over terrestrial networks.	10	L2	CO3	

OR					
Q.6	a.	With neat sketch, explain typical satellite TV network.	10	L2	CO3
	b.	Discuss Regional satellite system and National Satellite System.	10	L2	CO3
Module – 4					
Q.7	a.	Derive the equation of Numerical Aperture considering the ray path for meridional ray in optical fiber.	8	L2	CO4
	b.	Explain fiber bending loss with neat diagram write equation of critical radius of curvature for multimode and single mode fibers.	8	L2	CO4
	c.	A multimode step index fiber with a core diameter of 80 μ m and a relative index difference of 1.5% is operating at a wavelength of 0.85 μ m. If the core refractive index is 1.48 estimate the normalized frequency for the fiber and number of guided modes.	4	L3	CO4
OR					
Q.8	a.	Explain the linear and Non-linear scattering losses with suitable equations.	8	L2	CO4
	b.	Explain mode field diameter of single mode fiber.	4	L2	CO4
	c.	A 6 Km optical link consists of multimode step index fiber with a core RI of 1.5 and relative index different of 1% estimate : i) The delay difference between the slowest and fastest modes at the fiber output ii) RMS pulse broadening due to intermodal dispersion on the link iii) Maximum bit rate that may be obtained without substantiate errors on the link, only intermodal dispersion. iv) The bandwidth-length corresponding to (iii)	8	L3	CO4
Module – 5					
Q.9	a.	What are the characteristic requirements of an optical source? With the help of diagram, describe the operation of surface emitting LED.	8	L2	CO5
	b.	Explain and derive the equations for quantum efficiency and LED power.	8	L2	CO5
	c.	Explain with the help of neat diagram Distributed – Feedback (DFB) laser diode.	4	L2	CO5
OR					
Q.10	a.	Explain p-i-n photodiode with a neat diagram.	6	L2	CO5
	b.	Describe the principle of working of isolators and circulators with neat diagram.	8	L2	CO5
	c.	Write a note on : i) Dielectric thin film filters ii) Diffraction Gratings.	6	L2	CO5

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21EC62

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Microwave Theory and Antennas

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain Gunn effect with a neat schematic diagram. (10 Marks)
- b. Write a note on Microwave System. (10 Marks)

OR

- 2 a. Derive an expression for transmission coefficient of microwave transmission line. (10 Marks)
- b. A transmission line has the following parameters $R = 2\Omega/m$, $G = 0.5 \text{ m mho/m}$, $F = 1\text{GHz}$, $L = 8 \text{ nH/m}$, $C = 0.23 \text{ PF}$. Calculate :
 - i) The characteristics impedance
 - ii) The propagation constant(10 Marks)

Module-2

- 3 a. Write a various losses of S parameters. (10 Marks)
- b. What are Waveguide Tees? Explain its basic types with diagram. (10 Marks)

OR

- 4 a. Explain the Scattering representation of the multiport network with suitable diagram and matrix. (10 Marks)
- b. Write a note on coaxial connectors and adapters. (10 Marks)

Module-3

- 5 a. Briefly explain the following terms as a related to antenna system.
 - i) Directivity and gain
 - ii) Beam efficiency
 - iii) Radiation intensity
 - iv) Beam Area(10 Marks)
- b. A lossless parallel strip line has conducting strip width W . The substrate dielectric separating the two conducting strips has a relative dielectric constant ϵ_{rd} of 6 and a thickness d of 4 mm. Calculate :
 - i) The required width W of the conducting strip in order to have a characteristic impedance to 50Ω
 - ii) The strip-line capacitance
 - iii) The strip-line insurance
 - iv) The phase velocity of the wave in the Parallel strip line(10 Marks)

OR

- 6 a. Explain parallel stripline and coplanar strip line with relevant diagrams. (10 Marks)
- b. Explain Radio communication link with the relevant diagram. (10 Marks)

Module-4

- 7 a. Derive the expression for radiation resistance of a short-dipole with uniform current. (10 Marks)
- b. State and explain power theorem. (10 Marks)

OR

- 8 a. Explain the principles of pattern multiplication with example. (10 Marks)
- b. Derive an expression and draw the field pattern for an array of 2 isotropic point sources with same amplitude and phase speed $\lambda/2$ apart. (10 Marks)

Module-5

- 9 a. Explain Helical antenna with its helical geometry. (10 Marks)
- b. Derive the expression for radiation resistance of small loop antenna. (10 Marks)

OR

- 10 a. Explain the following antenna : (10 Marks)
- i) Yagi – Uda Array
 - ii) Parabolic reflector
- b. Explain the types of operating principle of Horn antenna and Rectangular horn antenna. (10 Marks)

* * * * *

Important Note :

1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. $42+8=50$, will be treated as malpractice.

[illegible]

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026
VLSI Design and Testing

Max. Marks: 100

Module-1

- OR**

- ## Module-2

- OR**

- [illegible]

(06 Marks)

Module-3

- 5 a. List out the classification of various semiconductor memories, along with their salient features. (05 Marks)
- b. Explain with an example the design of a 4-bit $\times$ 4-bit NAND based ROM array. (05 Marks)
- c. With neat diagram and waveform explain the read and write operation of 3T DRAM circuit. (10 Marks)

OR

- 6 a. Write the equivalent circuits of SRAM, Mask ROM and EPROM memory cells. (05 Marks)
- b. Explain with an example the design of a 4-bit $\times$ 4-bit NOR based ROM array. (05 Marks)
- c. With neat diagram and waveform explain the read and write operation of 6T SRAM circuits. (10 Marks)

Module-4

- 7 a. Explain with an example the Stuck at fault model. (05 Marks)
- b. What is Temporary Fault? Write a state diagram of Markov model with explanation. (05 Marks)
- c. Define PODEM. Explain the working of PODEM. (10 Marks)

OR

- 8 a. Explain with an example the various bridging faults. (08 Marks)
- b. Explain breaks, transistor stuck-ONs and opens faults in CMOS with an example. (07 Marks)
- c. Determine the Boolean difference equation for the following logic circuit in Fig.Q8(c), with respect to x_3 .

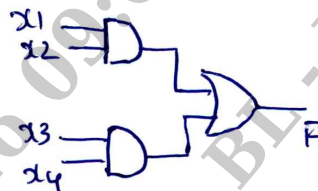


Fig.Q8(c)

(05 Marks)

Module-5

- 9 a. Explain the testing of sequential circuits as iterative combinational circuits. (06 Marks)
- b. Explain the three phases of the checking experiment. (06 Marks)
- c. Explain in detail the functional fault models. (08 Marks)

OR

- 10 a. Define Controllability and Observability with respect to sequential circuit testing. Explain with example. (05 Marks)
- b. Explain in detail the various LSSD rules. (10 Marks)
- c. Explain Random access scan technique. (05 Marks)

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21EC643

Sixth Semester B.E./B.Tech. Degree Examination, June / July 2026 Python Programming

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Demonstrate with Syntax of Python functions input(), len() and Print(). (06 Marks)
- b. What are the different flow control statements supports in python. Explain any 3 with a suitable example program and flow chart. (08 Marks)
- c. Write the Math Operator in python from highest to lowest precedence with an example for each. Write the steps how python is evaluating the expression $(5 - 1) * ((7 + 1) / (3 - 1))$ and reduce it to a single value. (06 Marks)

OR

- 2 a. What is a function? How to define a function in python? Write a program using function to find factorial of a number. (06 Marks)
- b. List and explain the different comparison and Boolean Operator, along with examples. (06 Marks)
- c. Develop a program to read the student details like Name, USN and Marks in 3 subjects. Display the student details, Total Marks and Percentage with suitable message. (08 Marks)

Module-2

- 3 a. What is a List? Explain the concept of slicing and indexing with proper examples. (06 Marks)
- b. Describe any two list Operations and list methods. Write a Python Program to accept 'n' numbers from the user. Find the sum of all even numbers and the product of all odd numbers in the entered list. (08 Marks)
- c. What is local and global scope of variable in Python? Explain the different scenarios with an example. (06 Marks)

OR

- 4 a. How are tuples different from list? Explain the following Operators in tuples.
 i) Sum of two tuples
 ii) Slicing Operations
 iii) Comparison two tuples. (06 Marks)
- b. List the merits of dictionary over list. Write a Python program to accept USN and Marks obtained. Find maximum, minimum and students USN who have scored in the range 100 – 85 , 85 – 75 , 75 – 60 and below 60 marks separately. (08 Marks)
- c. Demonstrate with suitable example of upper(), lower() and isupper() string methods. (06 Marks)

Module-3

- 5 a. Explain the steps involved in finding patterns of text with regular expression with example. (10 Marks)
- b. List out the different character classes. Bring out the steps involved in making your own character classes. (10 Marks)

OR

- 6 a. Explain the concept of file handling. Also explain reading and writing process with suitable examples. (07 Marks)
- b. Explain the concept of file path. Also discuss absolute and relative file path. (06 Marks)
- c. Explain reading and saving python program variables with the pprint.pformat() function. (07 Marks)

Module-4

- 7 a. Define class, objects and Attributes with an example. (06 Marks)
- b. Write a function called print time that takes a time object and print it in the form of hour : minute : second (07 Marks)
- c. Briefly explain the concept of Prototyping and Planning. (07 Marks)

OR

- 8 a. Explain Operator Overloading and Polymorphism methods with an example. (10 Marks)
- b. Demonstrate pure functions and modifier with example. (10 Marks)

Module-5

- 9 a. With an example, explain how to retrieve an image over HTTP. (10 Marks)
- b. Illustrate with a Python Program how to retrieve web pages with Urllib. (10 Marks)

OR

- 10 a. Write a python code to read binary files using Urllib. (10 Marks)
- b. Explain the concept of basic data modeling. (10 Marks)

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--

21EC653

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Basic VLSI Design

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. State and explain Moore's Law, with a neat graph. (04 Marks)
- b. Illustrate the different regions of operation of an nMOS transistor with the help of neat diagram. (08 Marks)
- c. Draw the circuit of CMOS inverter and explain DC transfer characteristics. (08 Marks)

OR

- 2 a. With neat diagram, discuss any three non – ideal effect of MOSFET. (06 Marks)
- b. Explain the various steps in CMOS n – well process with necessary diagrams. (10 Marks)
- c. List the key fabrication steps in an n – well BiCMOS process. (04 Marks)

Module-2

- 3 a. Draw the stick diagram for the following CMOS logic.
i) $\overline{(A + B)C}$ ii) 2 input Nand Gate. (08 Marks)
- b. With necessary diagrams, explain Lambda based design rules for wires and contact cuts. (06 Marks)
- c. Mention different types of MOSFET capacitances and explain the same with relevant equations and diagrams. (06 Marks)

OR

- 4 a. Draw the stick diagram of $\overline{(AB + C)D}$ and estimate the area. (08 Marks)
- b. Draw inverter layout and explain the Layout rules for transistors. (06 Marks)
- c. With equations, explain the calculations of inverter delay. (06 Marks)

Module-3

- 5 a. Define Scaling. Explain scaling factors with relevant equations. (10 Marks)
- b. Illustrate the design and data path of a 4 – bit arithmetic processor with neat diagram. (10 Marks)

OR

- 6 a. Illustrate the design of a 4 – bit shifter. (10 Marks)
- b. Explain the implementation of ALU function with an Adder. (07 Marks)
- c. Explain Regularity taking an example. (03 Marks)

Module-4

- 7 a. What is Switch Logic? Explain how switch logic is formed from simple pass transistor and transmission gates. (08 Marks)
- b. Illustrate the 2 – input Nand gate design using nMOS , CMOS and BICMOS. (08 Marks)
- c. Write a short note on Placement and Routing. (04 Marks)

OR

- 8 a. Explain Pseudo nMOS logic giving a suitable example with relevant equations. (08 Marks)
- b. Illustrate the Dynamic CMOS implementation of a 3 – input NAND gate with a neat circuit diagram. (06 Marks)
- c. Explain the generic structure of FPGA with a neat diagram. (06 Marks)

Module-5

- 9 a. Discuss various System Timing Considerations that affect the performance and reliability of digital systems. (06 Marks)
- b. Compare the 1T and 3T DRAM cell designs, with neat diagrams. (06 Marks)
- c. Discuss various fault models used in VLSI circuit and illustrate stuck – at, open and short circuit faults. (08 Marks)

OR

- 10 a. Explain the terms Observability , Controllability , Repeatability and Survivability in VLSI design for testability. (08 Marks)
- b. Explain the concept of Design for Testability (DFT) and discuss in detail the various DFT techniques with neat diagram. (12 Marks)

* * * * *

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

BEC/BTE/BVL601

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026

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.	Explain classification of Embedded System.		10	L1	CO1
	b.	Answer the following : i) Compare RISC and CISC. ii) Microprocessor V/S Microcontroller.		10	L2	CO1
OR						
Q.2	a.	Explain the following Embedded system components : i) LED ii) 7 Seg Display iii) Relay iv) Buzzer.		10	L1	CO1
	b.	Explain I2C Communication Interface with suitable block diagram and explain steps followed for Communication / Data transfer.		10	L1	CO1
Module – 2						
Q.3	a.	Explain the characteristics and quality attributes of Embedded Systems.		10	L1	CO2
	b.	Explain Data flow graph and Control data flow graph models in Embedded System Design.		10	L2	CO2
OR						
Q.4	a.	Write a block schematic of Embedded firmware design (Assembly language based) and development and explain operation of related software's Involved.		10	L1	CO2
	b.	With FSM model, explain the design and operation of automatic tea / coffee vending machine.		10	L2	CO2
Module – 3						
Q.5	a.	Define Process. Explain in detail Process state transition , States , Process control block.		10	L1	CO3
	b.	i) Explain Preemptive scheduling. ii) Determine average turnaround time and average waiting time if process P1, P2 , P3 with estimated completion time of 1.2 , 6 , 7 millisecond enter ready queue together and later P4 with a completion time of 2 m sec enters ready queue after 2 msec.		10	L2	CO3
OR						

Q.6	a.	Explain the following Task Communication techniques : i) Mailbox ii) Queuing iii) Signaling.	10	L1	CO3
	b.	Explain the concept of deadlock with a neat diagram. Mention the different conditions which favours a deadlock situation.	10	L2	CO3
Module – 4					
Q.7	a.	Explain ARM based embedded device with suitable block diagram.	10	L1	CO4
	b.	Explain following with respect to ARM Processor : i) Program status register ii) Processor modes iii) Registers.	10	L1	CO4
OR					
Q.8	a.	Explain ARM core data flow model with suitable block diagram.	10	L1	CO4
	b.	With neat block diagram, explain Embedded system software and functions of each software blocks.	10	L1	CO4
Module – 5					
Q.9	a.	Explain following instructions with suitable examples : i) BLX ii) RRX iii) BIC iv) TST.	10	L2	CO5
	b.	Write a program to arrange a series of 32 bit numbers in ascending order.	10	L2	CO5
OR					
Q.10	a.	Explain following instruction with suitable example : i) MLA ii) ORR iii) ROR iv) MVM	10	L2	CO5
	b.	Write a C program to display Hex digit 0 – F on 7 segment LED interface with suitable interfacing diagram.	10	L2	CO5

* * * * *

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

BCO601

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Microcontrollers and Embedded System

Time: 3 hrs.

Max. Marks: 100

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

Module – 1			M	L	C
Q.1	a.	Explain four major rules used to implement RISC philosophy and why ARM instruction set is most suitable for Embedded Applications.	10	L2	CO1
	b.	Explain ARM core dataflow Model.	10	L2	CO1
OR					
Q.2	a.	Explain various fields in the current program status register.	6	L2	CO1
	b.	Explain different operating modes of ARM processor.	6	L2	CO1
	c.	Discuss the following with diagram : i) Von Neumann Architecture with cache ii) Harvard Architecture with TCM.	8	L2	CO1
Module – 2					
Q.3	a.	Briefly explain the different Load – Store Instruction Categories used with ARM.	10	L2	CO1
	b.	Write an Assembly language program to find the square of a number (1 to 10) using look – up table.	10	L3	CO2
OR					
Q.4	a.	Explain different Data Processing Instructions in ARM.	10	L1	CO2
	b.	Write an assembly language program to find the largest / smallest number in an array of 32 numbers.	10	L3	CO2
Module – 3					
Q.5	a.	What is an Embedded System? Differentiate between general purpose computing system and embedded system.	10	L1	CO4
	b.	Briefly describe the classification of Embedded system.	10	L2	CO4
OR					
Q.6	a.	List and explain any 5 purposes of Embedded System with examples.	10	L2	CO4
	b.	With a neat diagram, explain the interfacing of stepper motor through the driver circuit to microcontroller.	10	L2	CO3

Module – 4					
Q.7	a.	Explain the Operational and Non - operational Quality attributes of an Embedded system.	10	L2	CO4
	b.	Explain characteristic of Embedded System.	6	L2	CO4
	c.	Explain different communication buses used in Automotive applications.	4	L2	CO4
OR					
Q.8	a.	Explain the fundamental issues in Hardware Software Co – design.	10	L2	CO5
	b.	Design FSM Model for Automatic seat belt warning system and FSM model for Automatic TEA vending machine.	10	L3	CO5
Module – 5					
Q.9	a.	With a neat diagram, explain Operating system architecture.	10	L2	CO5
	b.	Explain Multiprocessing , Multitasking and Multi programming.	10	L2	CO5
OR					
Q.10	a.	Define Process. Explain in detail the structure , memory organization and state transition of the process.	10	L2	CO5
	b.	Explain : i) Deadlock ii) Message passing.	10	L2	CO5

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026

Multimedia 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.	What do you mean by multimedia? State the basic form of representation of text, image, audio and video.	6	L2	CO1	
	b.	List the different types of multimedia networks and explain any two of them in detail with relevant diagrams.	8	L2	CO1	
	c.	Find the maximum block size that should be used over a channel which has a mean BER probability of 10^{-4} , if probability of a block containing an error and hence being discarded is to be 10^{-1} .	6	L3	CO1	
OR						
Q.2	a.	Determine the propagation delay associated with the following communication channels: i) A connection through a private telephone network of 1km. ii) A connection through a PSTN of 200 km iii) A connection over a satellite channel of 50,000 km Assume the velocity of propagation for (I) $2 \times 10^{-8} \text{ ms}^{-1}$ and for (II) $3 \times 10^8 \text{ ms}^{-1}$.	6	L3	CO1	
	b.	Explain simplex, duplex, broadcast and multicast operational modes of communication with neat sketch.	6	L2	CO1	
	c.	Explain the working principle of circuit mode and packet mode of operation in multimedia networks.	8	L2	CO1	
Module – 2						
Q.3	a.	Explain the signal encoder design and quantization operation of digitization principles in detail.	8	L2	CO2	
	b.	Illustrate the different types of text data representation.	6	L2	CO2	
	c.	Assuming the Bandwidth of a speech is from 50 Hz through 10 kHz and that of a music signal is from 15 Hz through 20 kHz, derive the bit rate that is generated by the digitization procedure in each case assuming that Nyquist sampling rate is used with 12 bits/sample for the speech signal and 16 bits/sample for the music signal. Derive the memory required to store a 10 min passage of stereophonic music.	6	L3	CO2	
OR						
Q.4	a.	With the help of a diagram, explain how the digital image produced by a scanner (or) digital camera, captured and stored within the memory of a computer.	10	L2	CO2	

BEC/BTE613A					
	b.	Derive the bit rate and memory requirements to store each frame that result from the digitization of both 525 and 625 line system assuring 4:2:2 format. Also, find the total memory required to store a 1.5 hr movie/video.	10	L3	CO2
Module – 3					
Q.5	a.	Discuss in detail about the following techniques: i) Runlength encoding ii) Statistical encoding iii) Differential encoding iv) Transform encoding v) Lossy and lossless compression	10	L2	CO3
	b.	A series of messages is to be transferred between two computers over a PSTN. The messages comprise just the characters A through H, analysis has shown that relative frequency of occurrence of each character is as follows: A and B = 0.25 C and D = 0.14, E, F, G and H = 0.055. i) Develop codeword set using Huffman coding tree. ii) Derive the average number of bits per character for your code set and compare with entropy and fixed length binary codeword and 7 bit ASCII codewords.	10	L3	CO3
OR					
Q.6	a.	A message comprising of a string of characters with probabilities: e = 0.3, n = 0.3, t = 0.2, w = 0.1, • = 0.1 is to be encoded. The message sent is 'went'. Construct the encoded version of the character 'went' using Arithmetic coding principles.	10	L3	CO3
	b.	Explain in detail with neat sketch JPEG encoder and decoder.	10	L2	CO3
Module – 4					
Q.7	a.	Explain in detail the technique of DPCM with neat diagram.	10	L2	CO3
	b.	Explain in detail about the concept of perceptual coding with required diagrams.	10	L2	CO3
OR					
Q.8	a.	With the help of frame sequence, explain the following types of compressed frame and reason for their use i) I-frame ii) B-frame iii) P-frame	10	L2	CO3
	b.	Describe the working principle of MPEG4 with encoder-decoder schematic.	10	L2	CO3
Module – 5					
Q.9	a.	Explain in detail about the working principle of CSMA/CD with neat sketch.	10	L2	CO4
	b.	Explain in detail about the operating principle of Token Ring network with relevant diagrams.	10	L2	CO4
OR					
Q.10	a.	Explain the architecture of transparent bridge with illustrative sketch.	10	L2	CO4
	b.	Explain in detail about FDDI network configuration and ring fault detection and isolation process with diagrammatic illustration.	10	L2	CO4

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

BEC654C/BTE654C

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Electronics Communication System

Time: 3 hrs.

Max. Marks: 100

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

Module – 1			M	L	C
Q.1	a.	Define Modulation. Explain the need for modulation.	10	L2	CO1
	b.	Explain the different types of communication channels.	10	L2	CO1
OR					
Q.2	a.	Explain with a neat block diagram, the elements of electronics and communication system.	10	L2	CO1
	b.	Explain analog communication system with a block diagram.	10	L2	CO1
Module – 2					
Q.3	a.	Define transmission efficiency of AM signal and derive its expression.	06	L3	CO2
	b.	Show how the modulation index can be computed by displaying the envelope on an oscilloscope.	10	L3	CO2
	c.	Describe the limitations of amplitude modulation.	4	L2	CO2
OR					
Q.4	a.	Define and explain amplitude modulation with necessary expressions and waveforms.	10	L2	CO2
	b.	An AM signal has a peak unmodulated carrier voltage $V_C = 100$ volts, a load resistance $R_L = 50 \Omega$ and modulation index $m_a = 1$. Determine the following : (i) Carrier power (ii) Lower sideband and upper sideband power. (iii) Total sideband power (iv) Total power of AM signal (v) Sketch the AM power spectrum	10	L3	CO2
Module – 3					
Q.5	a.	Explain the generation and demodulation of pulse position modulation.	10	L2	CO3
	b.	With neat diagram, explain pulse code modulation and demodulation.	10	L2	CO3

OR					
Q.6	a.	Define pulse amplitude modulation. Explain different types of sampling in PAM.	10	L2	CO3
	b.	Explain the generation and demodulation of pulse width modulation.	10	L2	CO3
Module – 4					
Q.7	a.	With necessary expressions and waveforms, explain amplitude shift keying (ASK).	6	L2	CO4
	b.	Describe Quadrature Phase Shift Keying (QPSK) with expressions and constellation diagram.	6	L2	CO4
	c.	Explain binary phase shift keying (BPSK) modulator and demodulator.	8	L2	CO4
OR					
Q.8	a.	Define Entropy and state its properties.	5	L2	CO4
	b.	A communication system consists of six message with probabilities $\frac{1}{8}, \frac{1}{8}, \frac{1}{8}, \frac{1}{8}, \frac{1}{4}$ and $\frac{1}{4}$ respectively. Determine the entropy of the system.	5	L3	CO4
	c.	Describe the four basic types of redundancy checks.	10	L2	CO4
Module – 5					
Q.9	a.	List and briefly explain the main application areas of wireless communication system.	10	L2	CO5
	b.	Discuss the advantages and disadvantages of wireless communication system.	10	L2	CO5
OR					
Q.10	a.	Explain cell structure in cellular communication.	10	L2	CO5
	b.	Describe the frequency reuse concept in cellular concept.	10	L2	CO5

CBBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21EC741

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 IoT and Wireless Sensor Networks

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define IoT. Describe the various characteristics of IoT. (08 Marks)
- b. With a neat sketch, explain the request-response and exclusive pair communication models of IoT. (08 Marks)
- c. Write a note on Big Data Analytics. (04 Marks)

OR

- 2 a. What is cloud computing? Explain the various IoT cloud based services. (08 Marks)
- b. Describe Level-3 IoT system with the help of a neat diagram and example. (08 Marks)
- c. With the help of neat diagram, explain the WebSocket Communication API (04 Marks)

Module-2

- 3 a. Describe how IoT Technology used to enable the agricultural industry to increase operational efficiency, reduce waste and improve the quality of their yields. (12 Marks)
- b. Explain the implementation of IoT technology into distributed energy systems to optimize the efficiency of energy infrastructure and reduce wastage in the following categories.
 - i) Smart Grids
 - ii) Renewable Energy System(08 Marks)

OR

- 4 a. Describe the implementation of IoT technology in the following areas. (12 Marks)
 - i) Structural Health Monitoring.
 - ii) Surveillance
 - iii) Emergency Response
- b. Explain how IoT technology is impacting the health care sector and changing over everyday lifestyle with the following sector.
 - i) Health and Fitness Monitoring
 - ii) Wearable Electronics(08 Marks)

Module-3

- 5 a. What is wireless sensor network? Describe the unique characteristics and constraints of wireless sensor network. (08 Marks)
- b. Explain the various different stages of development of wireless sensor networks. (12 Marks)

OR

- 6 a. Discuss the various challenges and hurdles of wireless sensor networks. (10 Marks)
- b. Elaborate the usage of wireless sensor network in military applications. (10 Marks)

Module-4

- 7 a. Discuss briefly the various hardware components used in single node architecture with diagram. (10 Marks)
- b. Explain in detail the following wireless technologies:
i) Bluetooth
ii) ZigBee (10 Marks)

OR

- 8 a. Discuss the design constraints or requirements for wireless sensor network. (10 Marks)
- b. Explain the following wireless technologies.
i) IEEE 802.22
ii) 3G Cellular Network (10 Marks)

Module-5

- 9 a. Discuss the various challenges and basic design principles of middleware for WSN. (08 Marks)
- b. With a neat diagram, explain the middleware architecture of WSN. (08 Marks)
- c. Classify the routing protocols employed in WSN. (04 Marks)

OR

- 10 a. Discuss the different traffic models and related performance aspects. (10 Marks)
- b. Explain the various performance metrics for WSN. (06 Marks)
- c. Write a note on Data Compression in WSN. (04 Marks)

* * * * *

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21EC733

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 DSP Algorithm and Architecture

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain digital signal processing with a neat block diagram. (05 Marks)
- b. Describe the decimation and interpolation with equation. Let $x(n) = [3, 2, -2, 0, 7]$. It is interpolated using a interpolation filter $b_k = [0.5, 1, 0.5]$ with interpolation factor -2. Determine the interpolation sequence. (10 Marks)
- c. Mention the differences between FIR and IIR filters. (05 Marks)

OR

- 2 a. Discuss unique architectural features implemented in any programmable DSP devices. (09 Marks)
- b. Describe LTI system with a suitable example. (04 Marks)
- c. An analog signal is sampled at rate of 8KHz if 512 samples of signals are used to compute DFT, $X(k)$ determine the analog and digital frequency between adjacent $X(k)$ elements. Also determine analog and digital frequencies corresponding to $k=64$. (07 Marks)

Module-2

- 3 a. Outline address generation unit of DSP system with a suitable diagram. (06 Marks)
- b. Elaborate the importance of logic and guard bits used in MAC unit. (08 Marks)
- c. Analyze the importance of parallelism and pipelining used in programmable DSP with help of 8 tap FIR Filter. (06 Marks)

OR

- 4 a. Illustrate the structure of a 4x4 Braun Multiplier and explain its concept. What is the need of Bangh Wooley multiplier? (05 Marks)
- b. Describe circular and Bit reversed addressing mode with necessary diagram. (10 Marks)
- c. Discuss the operation of barrel shifter with an example. (05 Marks)

Module-3

- 5 a. Describe the multiplier/adder unit of TMS320C54XX processor with a neat block diagram. (08 Marks)
- b. Discuss any four data addressing modes of TMS320C54XX DSP with examples. (04 Marks)
- c. Illustrate functional architecture of TMS320C54XX processor with block diagram. (08 Marks)

OR

- 6 a. Outline the pipeline operation of TMS320C54XX processor. (08 Marks)
- b. Describe the operation of Hardware timer with neat diagram. (08 Marks)
- c. Compare MAC and MACD construction. (04 Marks)

Module-4

- 7 a. Mention the significance of Q notation in DSP. (04Marks)
- b. Describe with help of block diagram and mathematical equations implementation of decimation filter on TMS320C54XX processor, (10 Marks)
- c. Discuss the implementation of FIR filter with a required diagram. (06 Marks)

OR

- 8 a. Determine optimum scaling factor to prevent overflow. (06 Marks)
- b. Write the subroutine for bit reversed order. (06 Marks)
- c. Write an assembly language program for TMS320C54XX processor to multiply two Q15 numbers to produce Q15 number. (06 Marks)
- d. Why zero padding is done before computing the DF7. (02 Marks)

Module-5

- 9 a. Describe the synchronous serial interface between C54XX and CODEC device. (08 Marks)
- b. Illustrate I/O interface timing diagram for read write sequence of operation. (06 Marks)
- c. Discuss clipping, auto correlation speech detector with a block diagram. (06 Marks)

OR

- 10 a. Outline the biotelemetry Receiver System with help of block diagram. (06 Marks)
- b. Describe working of interrupts in TMS320 DSP. (08 Marks)
- c. Illustrate memory space organization of TMS32054XX DSP. (06 Marks)

* * * * *

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21EC752

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 ARM Embedded Systems

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain RISC design philosophy with relevant details. (10 Marks)
- b. Explain current program status registers of ARM processor in detail. (10 Marks)

OR

- 2 a. Explain ARM design philosophy with relevant details. (10 Marks)
- b. Explain the concept of pipeline in ARM processor. (10 Marks)

Module-2

- 3 a. Explain branch instructions of ARM instructions with relevant detail. Give one example each. (10 Marks)
- b. Explain program status register instructions of ARM instructions in detail. (10 Marks)

OR

- 4 a. Explain single register load store instructions and multiple register load store instructions of thumb instructions in detail. (10 Marks)
- b. Explain stack instructions and software interrupt instructions of thumb instructions in detail. (10 Marks)

Module-3

- 5 a. Differentiate between Embedded and General computing systems. (10 Marks)
- b. Explain the application area and purpose of embedded system. (10 Marks)

OR

- 6 a. Differentiate between RISC and CISC processors. (10 Marks)
- b. Explain Big Endian and Little Endian formats in detail. (10 Marks)

Module-4

- 7 a. Explain characteristics of embedded systems in detail. (10 Marks)
- b. Explain operational quality attributes of an embedded system in detail. (10 Marks)

OR

- 8 a. Explain non operational quality attributes of an embedded system in detail. (10 Marks)
- b. Explain the following :
 - (i) Data flow graph / Diagram (DFG)
 - (ii) Control data flow graph / Diagram (CDFG)(10 Marks)

Module-5

- 9 a. Explain the types of operating system with relevant details. (10 Marks)
- b. Explain with relevant details how to choose an RTOS. (10 Marks)

OR

- 10 a. Explain Deadlock and explain about different conditions favouring deadlock situation. (10 Marks)
- b. Explain simulators and list the advantages and limitations of simulator based debugging. (10 Marks)

* * * * *

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

BEC701

Seventh Semester B.E./B.Tech. Degree Examination, June/July 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
Q.1	a.	Explain the typical microwave system with a neat block diagram.		4	L2	CO1,2
	b.	With the help of a functional block diagram, explain the construction and mode of working of a GUNN diode.		6	L2	CO1,2
	c.	Derive Transmission line equations in Voltages and current forms.		10	L3	CO1,2
OR						
Q.2	a.	Discuss the salient features of Transferred Electron Devices.		4	L2	CO1,2
	b.	A transmission line has the following parameter : $R = 2\Omega/m$, $G = 0.5 \text{ m mho/m}$ $f = 1 \text{ GHz}$, $L = 8\text{nH/m}$, $C = 0.23\text{pF}$ Calculate : i) Characteristics impedance ii) Propagation constant.		10	L3	CO1,2
	c.	Explain the standing waves with neat wave forms.		6	L2	CO1,2
Module – 2						
Q.3	a.	State and explain the properties of S-matrix representation of multiport networks.		4	L2	CO2,3
	b.	Derive the S-matrix for E-plane Tee and magic Tee.		10	L3	CO2,3
	c.	What are Attenuators? Explain the principle and working of precision type variable attenuator.		6	L2	CO2,3

OR					
Q.4	a.	Explain Circulator and Isolators in Microwave Devices.	4	L2	CO2,3
	b.	What are the characteristics of Magic Tee? And explain any 2 applications of magic tee.	6	L3	CO2,3
	c.	A 20 mW signal is fed into one of the collinear (port -1) of lossless H-plane T junction. Calculate the power delivered through each port when other ports are terminated in matched load.	10	L3	CO2,3
Module – 3					
Q.5	a.	Discuss the Microstrip operation along with a neat schematic and its characteristics impedance expression.	10	L2	CO4
	b.	Explain the operation of parallel strip line along with a neat diagram. Write down the expression for characteristics imp.	10	L2	CO4
OR					
Q.6	a.	State and prove Friss transmission equation.	10	L2	CO4
	b.	Discuss and Interpret on Antenna field zones.	10	L2	CO4
Module – 4					
Q.7	a.	State and explain the power theorem and its application to an isotropic source.	4	L2	CO5
	b.	Derive field expression of two isotropic point sources of same amplitude and phase.	8	L3	CO5
	c.	Derive an expression for radiation resistance of short electric Dipole.	8	L3	CO5
OR					
Q.8	a.	Distinguish between End fire array and Broad side array.	4	L2	CO5
	b.	Derive an array factor expression in case of linear array of 'n' isotropic point source of equal amplitude and spacing.	8	L3	CO5
	c.	Starting from electric and magnetic field potential, obtain the far-field component for a short dipole.	8	L3	CO5
Module – 5					
Q.9	a.	Derive an expression for radiation resistance of a small loop antenna.	12	L3	CO5
	b.	Explain different types of horn antennas with diagrams.	8	L2	CO5
OR					
Q.10	a.	Explain the constructional details for following antennas : i) Horn antenna ii) Parabolic reflector.	8	L2	CO5
	b.	Derive the far field expression for small loop antenna.	12	L3	CO5

* * * * *

--	--	--	--	--	--	--	--	--	--

Seventh Semester B.E./B.Tech. Degree Examination, June/July 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.	Define wireless communication systems. Explain Rayleigh fading wireless channels.	10	L2	CO1
	b.	Explain basic of wireless channel modelling.	10	L2	CO1
OR					
Q.2	a.	Explain the Doppler impact and Doppler fading on wireless channel.	10	L2	CO1
	b.	Describe in detail the concept of coherence time.	10	L2	CO1
Module – 2					
Q.3	a.	Explain the correlation properties of random CDMA spreading sequences.	10	L2	CO2
	b.	Describe CDMA mechanism with relevant mathematical expressions.	10	L3	CO2
OR					
Q.4	a.	Describe in detail MIMO – DFDM.	10	L2	CO2
	b.	Explain the working of single carrier frequency division multiple access using relevant equations. List the advantages of CDMA.	10	L2	CO2
Module – 3					
Q.5	a.	Describe the first generation cellular system in wireless communication cellular technologies. Explain key characteristics and standards.	10	L2	CO3
	b.	Describe the working of orthogonal frequency division multiple access.	10	L2	CO3
OR					
Q.6	a.	With neat block diagram, explain the working of GSM system architecture.	10	L3	CO3
	b.	Explain 2G digital cellular systems.	10	L2	CO3
1 of 2					

Module – 4

Q.7	a.	With relevant mathematical expressions, describe the MIMO system model using neat sketches wherever necessary.	10	L2	CO4
	b.	Write a note on MIMO Beam forming.	10	L2	CO4

OR

Q.8	a.	Explain singular value decomposition of MIMO channel.	10	L3	CO4
	b.	Describe in detail the concepts of SVD and MIMO capacity.	10	L3	CO4

Module – 5

Q.9	a.	With neat block diagram, describe the working principle Of Radio Interface Architecture.	10	L2	CO4
	b.	Explain Uplink SC-FDMA Radio Resources allocation.	10	L2	CO4

OR

Q.10	a.	Describe LTE design principles and network architecture along with its features and advantages.	10	L2	CO3
	b.	Explain Downlink OFDMA Radio resources.	10	L2	CO3

* * * * *

--	--	--	--	--	--	--	--	--	--

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Application Specific Integrated Circuit

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 full custom, semicustom and programmable ASIC's. Explain their applications.	10	L2	CO1
	b.	Illustrate the design flow of ASIC with a suitable diagram.	10	L2	CO1
OR					
Q.2	a.	What is the role of I/O cells in ASIC design? Explain with an example.	10	L2	CO1
	b.	Define Data path and explain any 8 datapath elements with neat diagram.	10	L2	CO3
Module – 2					
Q.3	a.	Explain ASIC Library Cell Design.	08	L2	CO2
	b.	With the help of relevant diagram, explain logical area and logical efficiency.	12	L2	CO1
OR					
Q.4	a.	With the help of neat diagram explain ACT – 1 Logic Module.	10	L3	CO2
	b.	With the help of neat diagram explain Xilinx XC3000 CLB.	10	L3	CO3
Module – 3					
Q.5	a.	Explain Hierarchical Design for Half Adder with schematic example.	10	L2	CO3
	b.	Explain the use of a bus to simplify the schematic with an example.	10	L3	CO3
OR					
Q.6	a.	Explain Look Ahead algorithm with the help of relevant diagrams.	10	L2	CO5
	b.	Write a brief note on : i) Constructive Partitioning ii) Iterative Partitioning Improvement	10	L3	CO5
Module – 4					
Q.7	a.	Explain Clock Planning with the help of neat diagrams.	10	L3	CO3
	b.	Explain the channel definition process importance in floor planning and its importance.	10	L3	CO3
OR					
Q.8	a.	Explain the iterative placement improvement technique and its relevance in physical design.	10	L3	CO5
	b.	Explain the following in ASIC floor plan : i) Clock Planning ii) Power Planning	10	L2	CO5
Module – 5					
Q.9	a.	i) List goals and objectives of global routing ii) Explain Back annotation.	10	L3	CO4
	b.	Explain global routing between blocks.	10	L4	CO4
OR					
Q.10	a.	Explain with relevant diagram, Area Routing Algorithms.	10	L4	CO4
	b.	i) Write a brief note on Global routing Methods. ii) Explain Measurement of Channel Density.	10	L3	CO4

--	--	--	--	--	--	--	--	--	--

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Embedded System Applications

Time: 3 hrs.

Max. Marks: 100

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

Module – 1			M	L	C
Q.1	a.	Explain Microprocessor Unit with a neat diagram.	10	L2	CO1
	b.	Summarize the applications of Embedded Systems.	10	L2	CO1
OR					
Q.2	a.	Discuss the figures of merit for an Embedded System.	10	L2	CO1
	b.	Explain the working of Embedded System with example.	10	L2	CO1
Module – 2					
Q.3	a.	Explain the Harvard Architecture in Microcontroller.	10	L2	CO2
	b.	Explain the need for open collector and bus-oriented system using Hi-Z logic.	10	L2	CO2
OR					
Q.4	a.	Discuss SRAM in detail.	10	L2	CO2
	b.	Describe the factors which tend to increase power dissipation along with attempt to reduce it.	10	L2	CO2
Module – 3					
Q.5	a.	Explain the working of Light Dependant Resistor (LDR) with a neat diagram.	10	L2	CO3
	b.	Explain the working operation of stepper motor.	10	L2	CO3

OR					
Q.6	a.	Discuss the advantages and disadvantages of serial system compared to parallel system.	10	L2	CO3
	b.	Describe the characteristics of DC motors.	10	L2	CO3
Module – 4					
Q.7	a.	Explain the functional block diagram of mobile phone.	10	L2	CO4
	b.	Discuss the spread spectrum techniques.	10	L2	CO4
OR					
Q.8	a.	Explain the working of an RFID system.	10	L2	CO4
	b.	Discuss Biomedical Applications.	10	L2	CO4
Module – 5					
Q.9	a.	Explain from where does the need of product originate.	10	L2	CO5
	b.	Discuss how the requirements are converted to technical specifications in product design.	10	L2	CO5
OR					
Q.10	a.	Explain PCB routing and PCB layers.	10	L2	CO5
	b.	Explain Design For Testability (DFT) and Levels of Testing.	10	L2	CO5

* * * * *