

CBCS SCHEME

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BEC402

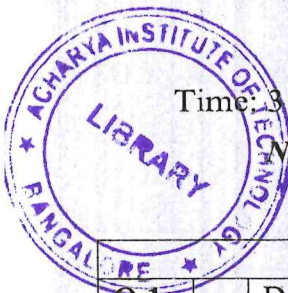
Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026

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

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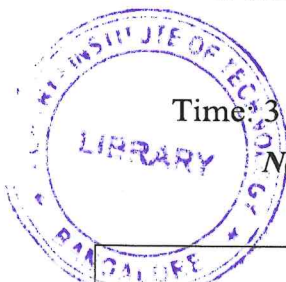
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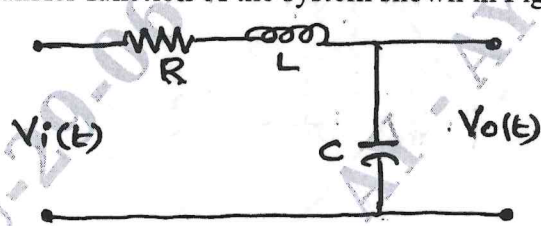
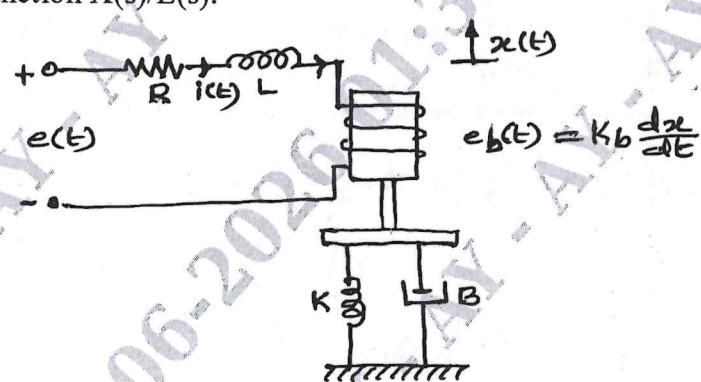
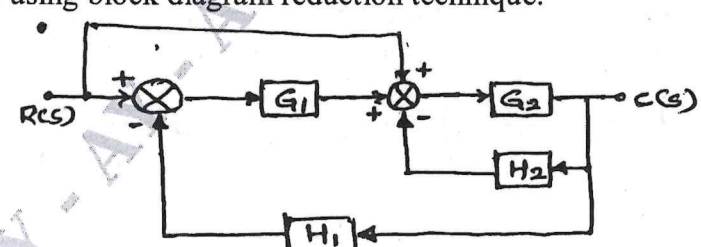
Control Systems

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). 	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 $X(s)/E(s)$. 	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. 	10	L3	CO1	

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

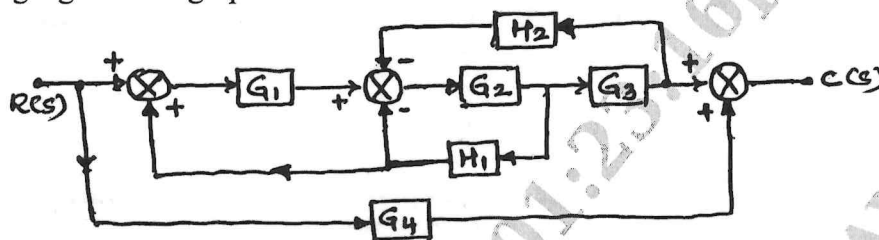


Fig.Q3(b)

OR

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

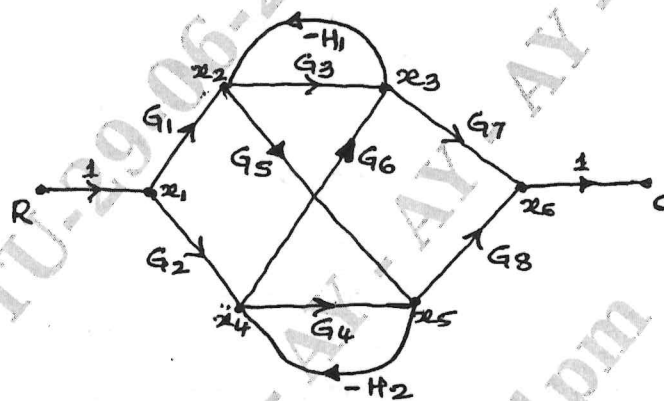


Fig.Q4(a)

- b. Compare Block diagram and Signal flow graph.
- c. Derive the transfer function of block diagram shown in Fig.Q4(c), using block diagram reduction technique.

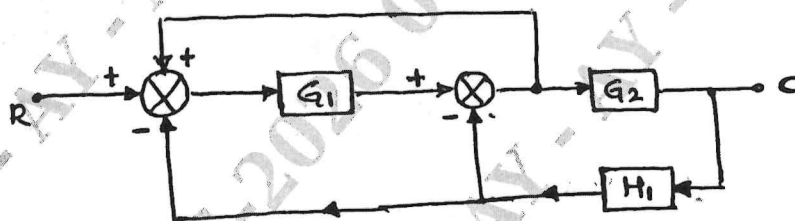


Fig.Q4(c)

Module – 3

- Q.5 a. Sketch the time response specification curve and deliberate on specification parameters.
- b. Obtain the response of unity feedback system, whose open loop transfer function is $G(s) = 3/s(s+4)$ for a unit-step input.
- 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.
- (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) $\frac{C(s)}{R(s)} = \frac{2}{s^2 + 4}$

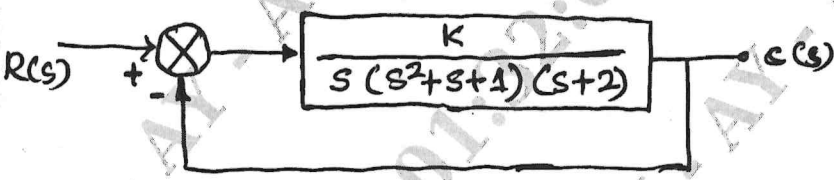
OR

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

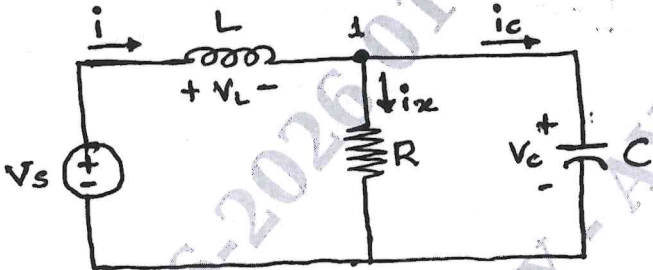
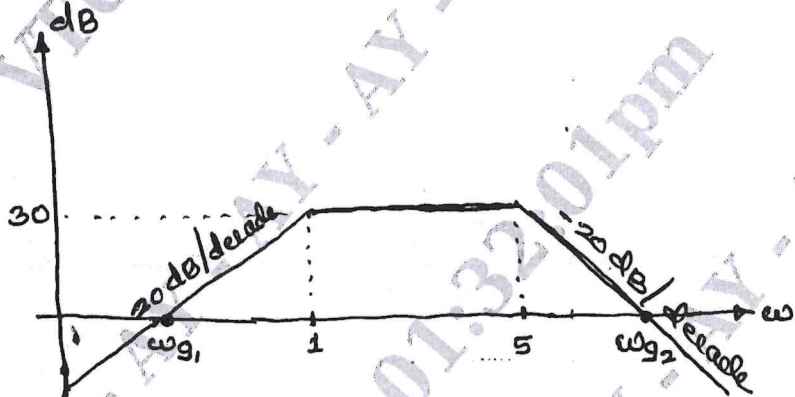
OR

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
