CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech III Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Network Analysis and Synthesis
Course Code	:	A402205
Branch	:	Electronics & Communication Engineering
Date & Session	:	26-11-2025 FN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
**Each question carries ONE mark.**   **10x1=10M**

1.	Define Tree of a Network.	1 M
2.	What is meant by self inductance?	1 M
3.	What is the time constant of series RL circuit?	1 M
4.	Define resonance.	1 M
5.	Write the equations for a two-port network in terms of Z-parameters.	1 M
6.	Define characteristic impedance.	1 M
7.	What is the function of Low pass filter?	1 M
8.	List any two types of attenuators.	1 M
9.	What is a driving point Impedance?	1 M
10.	What is a Hurwitz polynomial?	1 M

PART-B
Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). For the Given graph determine the Basic Tie-Set Matrix and Cut set Matrix ?   10M
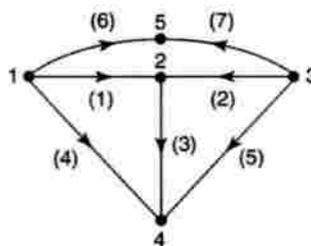

OR

11. B). Explain Dot Convention. Derive an Expression for Co-efficient of coupling in Magnetic circuits.   10M

12. A). i) Obtain an expression for Transient response of series RL Circuit with unit step signal input?   5M

ii) Derive an expression for Bandwidth of series RLC circuit.   5M

OR

12. B). i) Derive an expression for Resonant frequency of series RLC circuit.   5M

ii) A coil having R=20 Ω and L=0.1 H is connected in series with a capacitor C=100 µF. Determine a) Resonant frequency   b) Impedance at f_r.   5M
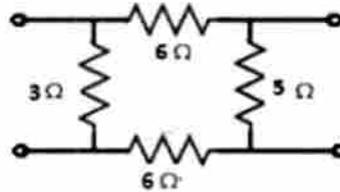
(P.T.O..)

13. A). i) Derive the relationship between impedance and admittance parameters. 5M

ii) Determine the transmission parameters of the network shown below. 5M
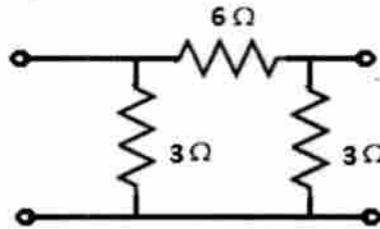
OR

13. B). i) Obtain the relation between Admittance parameters and Transmission parameters. 5M

ii) Find the Impedance parameters of the network shown below. 5M

14. A). Explain the characteristics of low-pass, high-pass, band-pass, and band-stop filters. 10M

OR

14. B). Explain the different types of attenuators with neat circuits. Derive the equations for attenuation and characteristic impedance. 10M

15. A). Define a positive real (PR) function. Test whether the given function $Z(s)=(s^2+3s+2)/s^2+2s+2$ is Positive Real or not? 10M

OR

15. B). Synthesize the LC impedance function $Z(s)=(s+4)/(s^2+3s+2)$ using Foster I and II methods. 10M

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Examination	:	B.Tech III Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Analog Circuits
Course Code	:	A404301
Branch	:	Electronics & Communication Engineering
Date & Session	:	28-11-2025 FN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark. 10x1=10M

1.	Define the transistor hybrid model.	1 M
2.	State the function of an emitter resistor in CE amplifiers.	1 M
3.	Name one key advantage of MOSFET over JFET.	1 M
4.	Identify one difference between BJT and MOSFET amplifiers.	1 M
5.	What is distortion in amplifiers?	1 M
6.	List of one type of coupling used in multistage amplifiers.	1 M
7.	Mention the main classification of feedback amplifiers.	1 M
8.	Name any one feedback configuration used in amplifiers.	1 M
9.	List of two types of LC oscillators.	1 M
10.	Identify one application of crystal oscillator.	1 M

PART-B
Answer the following. Each question carries TEN Marks. 5x10=50M

11.A). (i) Justify the effect of emitter resistance on low frequency response of a CE amplifier. Provide a circuit diagram with dimensioned capacitors. — 3M

(ii) For the common emitter with R_S = 500 Ω and R_L = 5 kΩ, Calculate A_I, A_V, A_{vs} and R_o. Assume h_{fe} = 50, h_{ie} = 1 kΩ, h_{oe} = 25 mA/V. — 7M

OR

11. B). i) Predict the impact on gain if coupling capacitors are removed in a CE amplifier, with calculations. — 3M

ii) Derive the expressions for A_i, A_v, R_i and R_o for CE amplifier. — 7M

12. A). i) Compare CS and CG JFET amplifiers in terms of gain and frequency response with labeled diagrams. — 3M

ii) For CS FET amplifier derive expression for gain and input resistance. — 7M

OR

12. B). Draw and label the circuit diagram of a MOSFET source follower and derive expression for gain. — 10M

13. A). i) Propose a solution to minimize distortion in RC coupled multistage amplifiers, supporting your suggestion with diagrams. — 3M

ii) Explain the various components of Hybrid π model. — 7M

(P.T.O..)

<div align="center">OR</div>

13. B). i) Analyze the advantages of cascade coupling over direct coupling in multistage amplifiers. 3M

ii) Expression for short circuit current gain for a CE amplifier. 7M

14. A). Derive input and output resistance for current shunt feedback and draw the circuit schematic with labeled units. 10M

<div align="center">OR</div>

14. B). (i) Illustrate the effect of feedback on bandwidth with sketches. 5M

(ii) A voltage series negative feedback amplifier has a voltage gain without feedback of $A = 500$, input resistance $Ri = 2$ K, output resistance $Ro = 15$ K and feedback ratio $= 0.01$. Calculate the voltage gain, input resistance and output resistance of the amplifier with feedback. 5M

15. A). Assess frequency and amplitude stability of RC oscillators; include a neat, dimensioned circuit diagram. 10M

<div align="center">OR</div>

15. B). Develop the circuit diagram of Hartley oscillator and label each component clearly and derive an expression for frequency of oscillation. 10M

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Examination	:	B.Tech III Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Probability Theory and Stochastic Processes
Course Code	:	A404302
Branch	:	Electronics & Communication Engineering
Date & Session	:	01-12-2025 FN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	Define the distribution function of a discrete random variable X.	1 M
2.	Write the properties of the conditional density function.	1 M
3.	Describe the joint moments about the origin.	1 M
4.	Define Gaussian random variable.	1 M
5.	Write about the Ergodicity in random variables.	1 M
6.	Give any two examples of a Poisson random process.	1 M
7.	Define cross correlation function of two variables.	1 M
8.	What is power spectral density?	1 M
9.	Define narrow band noise.	1 M
10.	Define Entropy.	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	i) State and Prove Baye's Theorem.	5M
	ii) Define the terms outcome, event, sample space, mutually exclusive events. Consider the experiment of rolling of two fair dice simultaneously and represent its sample space. Also give examples of terms mentioned above related to this experiment.	5M

OR

11. B).	i) Define random variable and classify. State the conditions for a function to be a random variable.	5M
	ii) State total probability theorem. A bag contains 2 white and 4 green balls. Another bag contains 3 white and 3 green balls. A bag is selected at random and a ball is drawn from it. What is the probability the ball is white.	5M

12. A).	Determine the following parameters for a uniformly distributed random variable.	10M
	(i) $\bar{X}$ (ii) σ_X^2 (iii) $M_X(v)$ (iv) $\phi_X(\omega)$	

OR

12. B).	i) Obtain the characteristic function of Poisson random variable.	5M
	ii) X and Y are two statistically independent random variables related to W as W= X + Y. Obtain the probability density function of Y in terms of probability density functions of X and Y.	5M

(P.T.O..)

13. A). i) Define autocorrelation function, state all its properties and prove any four. 5M
ii) Given the random processes $X(t) = A\cos\omega_0 t + B\sin\omega_0 t$ where ω_0 is a constant, and A 5M
and B are uncorrelated zero mean random variables having different density functions but
the variance σ^2, show that $X(t)$ is WSS.

OR

13. B). When do you call a random process as WSS & JWSS? Explain. 10M
A random process $X(t) = A_0\cos(\omega_0 t + \theta)$ where θ is a uniform random variable on $(0,2\pi)$.
Test whether $X(t)$ is wide sense stationary.

14. A). Derive the relationship between power spectral density and autocorrelation of a random 10M
process $X(t)$.

OR

14. B). Define the power spectral density of a random process, state and prove its properties. 10M

15. A). i) Explain with necessary expressions the Effective Noise Temperature and Average 5M
Noise Figure of cascaded networks.
ii) Two 2 port devices are connected in cascade. First stage noise figure and gain are 15dB 5M
and 42 respectively. For second stage noise figure and gain are 25 db and 35 respectively.
Compute overall noise figure

OR

15. B). List the steps in the Huffman source coding algorithm. A discrete memoryless source 10M
consists of *symbols* $x1$, $x2$, $x3$, $x4$, $x5$, $x6$, $x7$, and $x8$ with probabilities 0.2, 0.25, 0.2,
0.1, 0.1, 0.05, 0.05, and 0.05 respectively. Determine the efficiency of Huffman coding.

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Examination	:	B.Tech III Semester Regular & Supplementary Examinations Nov/Dec-2025
Course Name	:	Signals & Systems
Course Code	:	A404303
Branch	:	Electronics & Communication Engineering
Date & Session	:	03-12-2025 FN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1.	What is Orthogonal Space?	1 M
2.	Distinguish between Deterministic and Random signals.	1 M
3.	List any two properties of Fourier Series.	1 M
4.	Find the Fourier transform of $e^{-at} u(t)$.	1 M
5.	Define an LTI system.	1 M
6.	Explain about Paley-Wiener criterion.	1 M
7.	Define ROC of Laplace Transform.	1 M
8.	What is the Z-transform of a unit step signal?	1 M
9.	Define Sampling theorem.	1 M
10.	State Parsevals Energy theorem.	1 M

PART-B
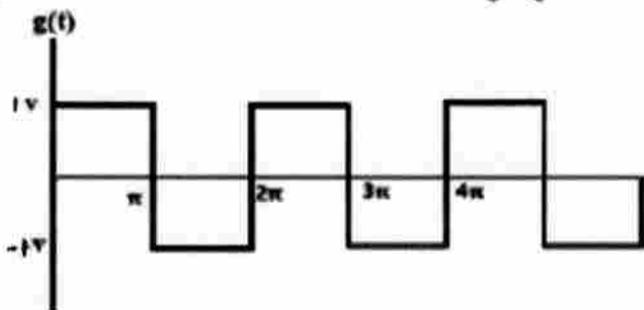**Answer the following. Each question carries TEN Marks.**   5x10=50M

11.A). Classify signals in both continuous time and discrete time with suitable examples.   10M

OR

11. B). Apply the orthogonality condition $\int x(t)y(t)\,dt=0$ to determine whether given signals are orthogonal.   10M

12. A). Find the exponential fourier series of the following signal.   10M

OR

12. B). i) State and prove Differentiation in time and time shifting property of Fourier transform.   5M
ii) Derive the expression for Fourier transform from Fourier series.   5M

(P.T.O..)

13. A).   i) Find the convolution between two signals $x(t)=e^{-3t}u(t)$, $h(t) = u(t+3)$.   5M
          ii) Explain the ideal filter characteristics.   5M

<center>OR</center>

13. B).   Derive the relationship between the bandwidth and rise time of ideal low pass Filter.   10M

14. A).   i) State initial and final value theorems of Laplace Transform.   5M
          ii) Find the Laplace transform of $x(t)=e^{-t}u(-t)+e^{5t}u(t)$.   5M

<center>OR</center>

14. B).   i) Find the inverse Z-transform of X(z), given $X(z) = 1/(1-az^{-1})$,   ROC: $z|>|a|$.   5M
          ii) Derive the difference between Laplace transform and Z-transform.   5M

15. A).   State and prove the sampling theorem for the band-limited signals using analytical   10M
          approach.

<center>OR</center>

15. B).   i) Show that R(r) and ESD form Fourier transform pair.   5M
          ii) Determine the properties autocorrelation function.   5M

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