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R22



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
(UGC AUTONOMOUS)

Examination : B.Tech III Semester Supplementary Examinations July-2025  
 Course Name : Network Analysis and Synthesis  
 Course Code : A402205  
 Branch : Electronics & Communication Engineering  
 Date & Session : 03-07-2025 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

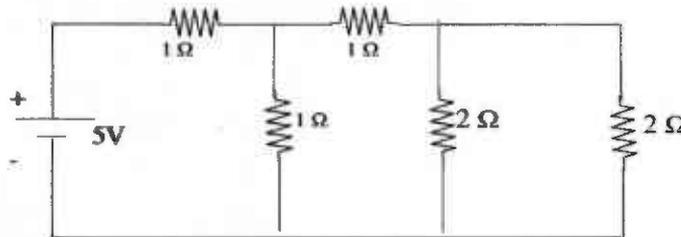
1. Define Tie-set and Tree of a network. 1 M
2. What is coefficient of coupling? 1 M
3. Define and write expression for time constant for RL circuit. 1 M
4. Write the relation between Quality factor and Bandwidth. 1 M
5. Write Y-parameters equations in-terms of Z parameters. 1 M
6. What is driving point admittance? 1 M
7. Draw the Ladder network. 1 M
8. Define poles and zeros of a network. 1 M
9. Differentiate between Band Pass and Band Elimination filters. 1 M
10. Draw the m-derived Low pass filter diagram. 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Find the cut-set matrix for the given network. 10M



**OR**

11. B). Explain the coefficient of coupling and derive the expression when two coils are mutually coupled. 10M
12. A). Derive an expression for Resonant frequency and quality factor for a series RLC circuit 10M
- OR**
12. B). Determine the complete solution for the current when switch S is closed at  $t = 0$ . Applied voltage is 10M

$$v(t) = 50 \cos\left(10^2 t + \frac{\pi}{4}\right)$$

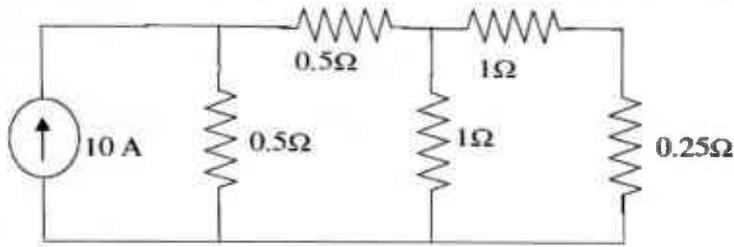
Resistance  $R = 10 \Omega$  and capacitance  $C = 1 \text{ m F}$ .

(P.T.O.)

13. A). Derive the expression for Driving Point Impedance at the Output Port with Source Impedance at the Input Port. 10M

**OR**

13. B). Determine the ABCD-parameters for the circuit as shown in figure. 10M



14. A). Explain and design a T-TYPE ATTENUATOR with neat diagram. 10M

**OR**

14. B). Design a m-derived high pass filter with a cut-off frequency of 50 kHz; design impedance of  $10\ \Omega$  and  $m = 0.7$ . 10M

15. A). Synthesize the LC network by Causer form. 10M

**OR**

15. B). Derive the driving point admittance of a ladder network. 10M

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**CMR COLLEGE OF ENGINEERING & TECHNOLOGY  
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**Examination** : B.Tech III Semester Supplementary Examinations July-2025  
**Course Name** : Analog Circuits  
**Course Code** : A404301  
**Branch** : Electronics & Communication Engineering  
**Date & Session** : 05-07-2025 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. Why is ' $h_{fe}$ ' important in small-signal amplifiers? 1 M
2. List the important characteristics of CE amplifier. 1 M
3. What is Cascode amplifier? 1 M
4. List the advantages of the source follower. 1 M
5. Define Gain Bandwidth Product 1 M
6. What are the elements in the hybrid  $\pi$  model? 1 M
7. What is meant by positive and negative feedback? 1 M
8. List the four basic feedback topologies. 1 M
9. What are the conditions for oscillation? 1 M
10. Which oscillator type is commonly used in radio frequency (RF) applications? 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Draw the h-parameter equivalent circuit for a typical common emitter amplifier and determine the expression for  $A_i$ ,  $A_V$ ,  $R_i$  and  $R_O$ . 10M

**OR**

- 11.B). Draw the small signal low frequency h- parameter model of CE, CB, and CC configurations and compare voltage gain, current gain, input impedance, output impedance. 10M

12. A). Explain the design and operation of a cascode amplifier. Describe its advantages in low-voltage applications and analyze its frequency response and output impedance. 10M

**OR**

12. B). Determine the expression for  $A_v$  and  $R_o$  for common gate amplifier. 10M

13. A). Using hybrid  $\Pi$  model, Determine an expression for common emitter short circuit current gain and its variation on frequency. Also obtain expressions for  $f_\beta$  and  $f_T$ . 10M

**OR**

13. B). Explain the structure and operation of a cascade RC-coupled amplifier. How does cascading multiple amplifier stages affect gain, bandwidth, and overall frequency response? 10M

(P.T.O.)

14. A). Show that for a current series feedback amplifier the input and output resistances are increased by a factor of  $(1+A\beta)$  with feedback. 10M

**OR**

14. B). Explain the features of following feedback amplifiers: (i) Voltage series feedback amplifiers (ii) Current shunt feedback amplifiers. 10M

15. A). Describe the design and operation of a phase-shift oscillator. Derive the expression for the frequency of oscillation. 10M

**OR**

15. B). Explain Barkhausen criteria for sustained oscillations. For Wien bridge oscillator, derive an expression for frequency of oscillations. 10M

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**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
**(UGC AUTONOMOUS)**

**Examination** : B.Tech III Semester Supplementary Examinations July-2025  
**Course Name** : Probability Theory and Stochastic Processes  
**Course Code** : A404302  
**Branch** : Electronics & Communication Engineering  
**Date & Session** : 08-07-2025 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 Random variable and mention its types. 1 M
2. Mention the properties of single variable PDF. 1 M
3. Define Joint PDF. 1 M
4. Mention the properties of Joint CDF. 1 M
5. Define Random Process. 1 M
6. Define crosscorrelation function. 1 M
7. Define Power spectrum density. 1 M
8. Mention power spectrum properties. 1 M
9. Define Noise. 1 M
10. Define Entropy. 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). For the given random variable "X" plot i) PDF and express using impulse function X 10M  
ii) CDF and express using unit function.

<b>X</b>	<b>Xa=0</b>	<b>Xb=1</b>	<b>Xc=2</b>	<b>Xd=3</b>	<b>Xe=4</b>
<b>P(X=x)</b>	<b>0.24</b>	<b>0.32</b>	<b>0.20</b>	<b>0.21</b>	<b>0.03</b>

**OR**

11. B). Define random variables and plot the PDF and CDF of random variable Y distributed 10M  
uniformly between the intervals  $y_1=3$  and  $y_2=4$ .

12. A). Define an exponential random variable. Obtain the characteristic function of an 10M  
exponential random variable and using the characteristic function derive its mean and  
variance.

**OR**

12. B). Define a Poisson random variable. Obtain the characteristic function of a Poisson random 10M  
variable and hence find mean and variance using the characteristic function.

13. A). Define the autocorrelation function (ACF) of a random process and discuss its properties. 10M

(P.T.O.)

**OR**

13. B). A random process is described by  $X(t) = A\cos(\omega_c t + \theta) + B$  Where A, B,  $\omega_c$  are constants and where  $\theta$  is a random variable uniformly distributed between  $\pm\pi$ . Is  $X(t)$  wide-sense stationary? If not, then why not? If so, then what are the mean and the autocorrelation function for the random process? 10M
14. A).  $X(t)$  and  $Y(t)$  are independent, jointly wide-sense stationary random processes given by,  $X(t) = A\cos(\omega_1 t + \theta_1)$  and  $Y(t) = B\cos(\omega_2 t + \theta_2)$ . If  $W(t) = X(t)Y(t)$  then find the ACF  $R[W(\tau)]$ ? 10M

**OR**

14. B). Derive the relationship between power spectrum and autocorrelation function. 10M
15. A). What is narrowband noise? Discuss the properties of the Quadrature components of a narrowband noise. 10M

**OR**

15. B). A source emits an independent sequence of symbols from an alphabet consisting of 5 symbols A, B, C, D and E with probabilities  $P = \{0.4, 0.2, 0.2, 0.1, 0.1\}$ . Determine Huffman code by, i) Shifting the combined symbols as high as possible. ii) Shifting the combined symbol as low as possible. 10M

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**OR**

13. B). Define impulse response of an LTI system? Consider a stable LTI system characterized by the differential equation:  $\frac{dy(t)}{dt} + 2y(t) = x(t)$ . Find its impulse response. 10M

14. A). Solve for the inverse Laplace transform of 10M

(i)  $X(s) = \frac{5s+13}{s(s^2+4s+13)}$ ,  $\text{Re}(s) > 0$ .

(ii)  $X(s) = \frac{3s^2+8s+6}{(s+2)(s^2+2s+1)}$ ,  $\text{Re}(s) > 0$ .

**OR**

14. B). State and prove initial value and final value theorem of Z-transform. 10M

15. A). State and prove the sampling theorem for the band-limited signals with the help of graphical representation. 10M

**OR**

15. B). (i) Explain about the effects of the under sampling. 5M

(ii) Find the Nyquist rate and Nyquist interval for the following signals 5M

(a)  $x(t) = 1 + \cos 2000\pi t + \sin 4000\pi t$ ; (b)  $10 \sin 40\pi t \cdot \cos 300\pi t$

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