

H.T No:

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

**R22**



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

**Examination** : B.Tech III Sem Regular & Supplementary Examinations December-2024  
**Course Name** : Network Analysis and Synthesis  
**Course Code** : A402205  
**Branch** : Electronics & Communication Engineering  
**Date & Session** : 21-12-2024 AN **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. Mention some properties of a tie-set. 1 M
2. If a current enters the dotted terminal of one coil, the reference polarity of the mutual voltage in the second coil is positive at the dotted terminal of the second coil. Is the statement TRUE/FALSE? 1 M
3. What is the relationship between bandwidth and quality factor for a series RLC circuit? 1 M
4. What is resonance in an ac circuit? 1 M
5. Why hybrid parameters are required even though Z and Y parameters are available? 1 M
6. Which parameters are called as immittance parameters? 1 M
7. Which electrical circuits can be used for constructing filters? 1 M
8. What is the difference between low pass filter and high pass filter? 1 M
9. What is driving point admittance, write its transfer function. 1 M
10. What are the poles and zeros of the linear system described by the differential equation 1 M  

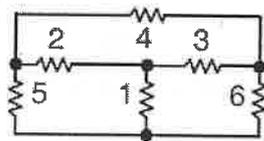
$$\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = 2\frac{du}{dt} + 1$$

**PART-B**

**Answer the following. Each question carries TEN Marks.**

**5x10=50M**

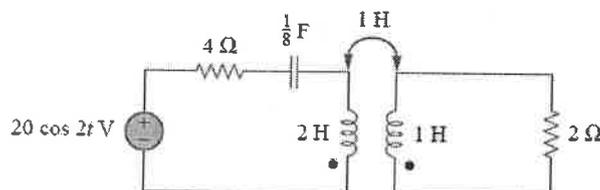
- 11.A). i) For the network shown in Fig. 3.60, draw the graph and a possible tree. Show the links and write the tie-set matrix. 5M



- ii) Explain the procedure for Obtaining fundamental cut set matrix. 5M

**OR**

- 11.B). Consider the circuit shown below. Determine the coupling coefficient. Calculate the energy stored in the coupled inductors at time  $t = 1.5$  s. Also draw the frequency domain equivalent of the circuit. 10M



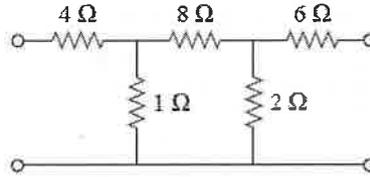
(P.T.O..)

12. A). Derive the expression for the response in a series RL circuit for DC excitation. 10M

OR

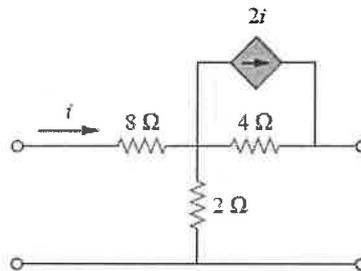
12. B). A series-connected circuit has R 4 Ω and L 25 mH. (a) Calculate the value of C that will produce a quality factor of 50. (b) Find  $\omega_1$ ,  $\omega_2$  and BW. (c) Determine the average power dissipated at  $\omega = \omega_0$ ,  $\omega_1$ ,  $\omega_2$ . Take  $V_m = 100$  V. 10M

13. A). Find the transmission parameters for the circuit given below. 10M

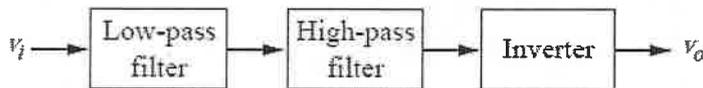


OR

13. B). Obtain the y parameters for the two-port network given below. 10M



14. A). Design a bandpass filter in the form shown below to pass frequencies between 250 Hz and 3000 Hz and with K = 10. Select R = 20 kΩ. 10M



OR

14. B). Derive expression for symmetrical T attenuator. 10M

15. A). Find the first and second Cauer forms of LC networks, including element values, for the given impedance function. 10M

$$Z(s) = \frac{s(s^2 + 4)}{2(s^2 + 1)(s^2 + 9)}$$

OR

15. B). Synthesize the first and second Foster forms of LC networks for the given impedance function. 10M

$$Z(s) = \frac{(s^2 + 1)(s^2 + 9)}{s(s^2 + 4)}$$

\*\*\*\*\*

H.T No:

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

R22



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

**Examination** : B.Tech III Sem Regular & Supplementary Examinations December-2024  
**Course Name** : Analog Circuits  
**Course Code** : A404301  
**Branch** : Electronics & Communication Engineering  
**Date & Session** : 24-12-2024 AN **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. Classify the amplifiers according to the method of coupling 1 M
2. What does 'g<sub>m</sub>' stand for in a BJT small-signal model? 1 M
3. List the advantages and disadvantages of cascode stage. 1 M
4. What is the folded cascode amplifier? Discuss. 1 M
5. Discuss the need of Darlington pair circuit 1 M
6. What are the elements in the hybrid  $\pi$  model? 1 M
7. Classify the various negative feedback amplifiers. 1 M
8. What is the purpose of negative feedback in amplifiers? 1 M
9. For a phase shift oscillator, the feedback network uses R=6 K $\Omega$  and C=1500 pF. Evaluate the frequency of oscillation 1 M
10. State Barkhausen criterion for sustained oscillation. What will happen to the oscillation if the magnitude of the loop gain is greater than unity? 1 M

**PART-B**

**Answer the following. Each question carries TEN Marks.**

**5x10=50M**

- 11.A). Discuss the low frequency response of BJT amplifier and the effect of coupling and bypass capacitors. 10M

**OR**

11. B). Explain hybrid parameter model for common base and common emitter modes along with the suitable equations and diagrams. 10M

12. A). Draw and explain the CS amplifier with current source load. Derive an expression for A<sub>v</sub>. 10M

**OR**

12. B). Derive the expression for the voltage gain of a common-drain FET amplifier and explain why this configuration is also called a source follower. Discuss its applications. 10M

13. A). For the Darlington connection, determine an expression for current gain and input resistance for first and second stage. Also calculate overall current gain. 10M

**OR**

13. B). Explain the frequency response of multistage amplifiers and describe the factors that determine the low-frequency and high-frequency cutoffs. 10M

**(P.T.O..)**

14. A). For the current series feedback amplifier, determine an expression for input resistance with feedback and output resistance with feedback. 10M

**OR**

14. B). Discuss the four types of feedback in amplifiers: voltage-series, voltage-shunt, current-series, and current-shunt. Explain how each feedback type affects the amplifier's input impedance, output impedance. 10M

15. A). Explain the operation RC phase shift oscillators and derive an expression for frequency of oscillations 10M

**OR**

15. B). i) Draw and explain the operation of Colpitt's oscillator. 5M

ii) Calculate the frequency of oscillations in Colpitt's oscillator if  $C_1 = C_2 = 3nF$ ,  $L = 200\mu H$ . 5M

\*\*\*\*\*

H.T No:

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

R22



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

Examination : B.Tech III Sem Regular & Supplementary Examinations December-2024  
Course Name : Electronics Devices and Circuits  
Course Code : A404203  
Branch : CSE/ CSC/ CSM/ CSD  
Date & Session : 24-12-2024 AN                      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 static resistance. 1 M
2. Write the effect of temperature on diode characteristics. 1 M
3. What is regulation? 1 M
4. List the differences between different filters. 1 M
5. Define current amplification factor. 1 M
6. What is emitter follower? Draw the circuit diagram of CC configuration. 1 M
7. Why is FET call as voltage-controlled device? 1 M
8. Draw the symbol of MOSFET and FET. 1 M
9. Write about the principle of operation of solar cell and LED. 1 M
10. Draw the two transistor equivalent circuit of SCR. 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). i) Explain about diode switching times with diagram. 5M  
ii) With suitable expressions explain transition capacitance. 5M

**OR**

11. B). i) Explain the operation p-n junction diode under forward biased condition with characteristics. 5M  
ii) Write about static and dynamic resistance of diode from the characteristics. 5M

12. A). i) Explain operation of positive clipper with neat diagram and wave form. 5M  
ii) With suitable wave forms explain bridge rectifier. 5M

**OR**

12. B). i) Describe the operation of full wave rectifier with  $\pi$ -section filter. 5M  
ii) A 50 Hz transformer having 60 V r. m. s. on each side of the center tap supplies a full wave rectifier circuit. The circuit load is 210  $\Omega$  with a shunt capacitor filter of 1000  $\mu$ F. Find the ripple factor. 5M

13. A). i) Explain the working of PNP transistor. 5M  
ii) Write the differences between CB, CE, and CC Amplifier Configurations. 5M

**OR**

13. B). i) Explain how the transistor acts as a switch. 5M  
ii) Explain the operation of CE configuration with the help of input and output characteristics. 5M

(P.T.O.)

14. A). i) Explain the construction and operation of JFET. 5M  
ii) Compare BJT and FET. 5M

**OR**

14. B). i) Explain the operation of enhancement MOSFET with characteristics. 5M  
ii) Draw the drain and transfer characteristics of FET and explain. 5M

15. A). i) Explain the operation of Zener diode as voltage regulator. 5M  
ii) Explain the operation of UJT with neat diagram and characteristics. 5M

**OR**

15. B). i) Describe the principle of operation of tunnel diode. 5M  
ii) Explain the working of semiconductor photo diode. 5M

\*\*\*\*\*

H.T No:

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

R22



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

**Examination** : B.Tech III Sem Regular & Supplementary Examinations December-2024  
**Course Name** : Signals & Systems  
**Course Code** : A404303  
**Branch** : Electronics & Communication Engineering  
**Date & Session** : 30-12-2024 AN **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 are orthogonal functions? 1 M
2. What is orthogonal signal space? 1 M
3. What is the trigonometric Fourier series pair? 1 M
4. State Linearity property of Fourier Transform. 1 M
5. What are the conditions for distortion less transmission through LTI systems? 1 M
6. What is the relation between rise time and bandwidth? 1 M
7. Define Region of Convergence of Laplace Transforms. 1 M
8. State initial value theorem of Z-transform. 1 M
9. What is Nyquist rate of the signal  $x(t) = 10 \text{ Sinc}(100\pi t)$ ? 1 M
10. State the relationship between Convolution and Correlation. 1 M

**PART-B**

**Answer the following. Each question carries TEN Marks.**

**5x10=50M**

- 11.A). Obtain the condition under which two signals  $x_1(t)$  and  $x_2(t)$  are said to be orthogonal to each other. Hence, prove that  $\text{Sin } n \omega t$  and  $\text{Cos } m \omega t$  are orthogonal to each other for all integer values of  $m, n$ . 10M

**OR**

11. B). Define Energy and power of analog signals and discrete time signals with necessary expressions. Prove that unit step signal is a power signal. 10M

12. A). What are Dirichlet's conditions for existence of Fourier series for a periodic signal? State and prove Time Convolution property of Fourier Series. 10M

**OR**

12. B). Compute the Fourier Transforms of the following signals and also draw the magnitude spectrum of the same. (i)  $x(t) = \text{Cos } \omega t$  (ii)  $x(t) = e^{-a|t|}$  10M

13. A). Derive the relationship between Bandwidth and rise time. 10M

**OR**

13. B). State the properties of Convolution. Find the convolution of the following signals using graphical method  $x(t) = e^{-5t}$  and  $h(t) = u(t+5)$ . 10M

**(P.T.O..)**

14. A). Find inverse Laplace Transform of the following for ROCs mentioned: 10M

$$X(s) = \frac{s^2 + 2s + 5}{(s + 3)(s + 5)^2}$$

(i)  $\text{Re}(s) < -5$

(ii)  $\text{Re}(s) > -3$

(iii)  $-5 < \text{Re}(s) < -3$

**OR**

14. B). State and prove any three properties of Z-Transforms. 10M

15. A). State and prove Sampling theorem with neat sketches. Explain the effect of under sampling. 10M

**OR**

15. B). Explain the role of Correlation in detecting the periodic signals in the presence of noise in a communication receiver. 10M

\*\*\*\*\*

H.T No:

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

R22



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

Examination : B.Tech III Sem Regular & Supplementary Examinations Dec-2024/Jan-2025  
Course Name : Probability Theory and Stochastic Processes  
Course Code : A404302  
Branch : Electronics & Communication Engineering  
Date & Session : 07-01-2025 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. Write the axioms of probability. 1 M
2. What is the condition for a function to be a random variable? 1 M
3. When two different random variables are said to be statistically independent? 1 M
4. State central limit theorem. 1 M
5. Define a mean-ergodic process. 1 M
6. Define wide sense stationary process. 1 M
7. What is power spectral density? 1 M
8. Define cross correlation function of two variables X&Y. 1 M
9. Define thermal noise. 1 M
10. Define mutual information. 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). A pair of fair dice is thrown in a gambling problem. Person A wins if the sum of numbers showing up is six or less and one of the dice shows four. Person B wins if the sum is 5 or more and one of the dice shows a four. Find: (i) The probability that A wins. (ii) The probability of B winning. (iii) The probability that both A and B wins.(iv) The probability that neither A nor B wins. 10M

**OR**

11. B). Write and plot probability density function and probability distribution function of the following random variables: 10M
- i) Uniform random variable.
  - ii) Exponential random variable.
  - iii) Gaussian random variable.
12. A). Two random variables X and Y have means  $X= 1$  and  $Y = 2$  variance  $(X) = 4$  and  $(Y) = 1$  and a correlation coefficient  $\rho_{XY} = 0.4$ . New random variables W and V are defined by  $V = -X + 2Y$ ,  $W = X + 3Y$ . Find: (i) The means. (ii) The variances. (iii) The correlation between V and W. 10M

(P.T.O..)

**OR**

12. B). The joint density function of the random variables X and Y is given as 10M  
 $f_{XY}(x,y) = kxy \{ 0 \leq x \leq 1, 0 \leq y \leq 1, \}$   
Find (i) the value of k  
(ii) the marginal densities of the random variables X&Y  
(iii) Are the random variables X&Y statistically independent.

13. A). What is Autocorrelation Function of a random process? State and explain any four properties of Autocorrelation Function. 10M

**OR**

13. B). Given  $\bar{X} = 6$   $R_{XX}(t, t + \tau) = 36 + 25 \exp(-\tau)$  10M  
Indicate which of the following statements are true and mention reasons also. The random process X(t)  
i) Is first order stationary?  
ii) Has total average power of 61 W.  
iii) Is ergodic.  
iv) Is wide sense stationary?  
v) Has a periodic component.

14. A). Prove that Power Spectral Density and Autocorrelation Function of a random process form a Fourier transform pair. 10M

**OR**

14. B). i) The power spectral density of a stationary random process is given by 6M  
 $S_{XX}(\omega) = A ; -k < \omega < k$  and zero elsewhere  
Find the autocorrelation function of the random process X(t)  
ii) Discuss any two properties of power spectral density. 4M

15. A). Define Channel capacity of discrete channel, and Shannon-Hartley law with an example to justify the power bandwidth tradeoff. 10M

**OR**

15. B). A message source generates one of eight independent messages randomly every second. 10M  
The probabilities of these messages are  $1/3, 1/3, 1/9, 1/9, 1/27, 1/27, 1/27$ . Find the source entropy and develop Huffman code.

\*\*\*\*\*