H.T No: | | | | | | | | | | | R22 | Course Code: A400007

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech III Semester Regular Examinations February-2024

Course Name: NUMERICAL METHODS AND COMPLEX VARIABLES

(Common for EEE & ECE)

Date: 05.02.2024 AN **Time: 3 hours** **Max.Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries ONE mark. **10x1=10M**

1. Define Intermediate Value theorem. 1 M
2. List the operators in finite differences. 1 M
3. Tell the formula for Trapezoidal rule. 1 M
4. Recall Initial value problem. 1 M
5. Define Harmonic function. 1 M
6. Write C – R equations in Cartesian form. 1 M
7. State Cauchy – Integral formula. 1 M
8. State Taylor's theorem. 1 M
9. What is the value of $a_0 = \int_0^1 x dx$. 1 M
10. What is the value of $b_n = \int_{-2}^{2} x^2 \sin x dx$. 1 M

PART-B

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

11.A). i) Find a real root of the equation $\cos x - xe^x = 0$ by using Newton – Raphson method. 5M

ii) Find a real root of the equation $x^3 - 5x + 1 = 0$ by using Bisection method. 5M

OR

11. B). Consider the weight (lbs) of the human beings versus the height (inches) of human beings. The relation between them are given in the following table 10M

Height (x)	4.6	4.8	5.0	5.2	5.4	5.6	5.8
Weight (y)	48	51	57	61	65	69	70

Find the weight of human being having height 5.32 inches using Gauss - backward interpolation formula.

12. A). Evaluate $\int_0^1 \sqrt{1+x^3}\,dx$ taking h = 0.1 by using Trapezoidal rule and Simpson's rule 1/3rd. 10M

Hence write your observation about the difference between the values obtained by Trapezoidal and Simpson's rules.

(P.T.O..)

OR

12. B). Solve the differential equation $\frac{dy}{dx} = \frac{2xy + e^x}{x^2 + xe^x}, y(1) = 0$ by using Runge – Kutta fourth order method and hence evaluate y(1.2), y(1.4). 10M

13. A). If w = u(x, y) + i v(x, y) be complex potential for an electric field, if $v(x, y) = x^2 - y^2 + x/(x^2 + y)$, then find the expression for u(x, y) by using Milne – Thomson method. 10M

OR

13. B). Find bilinear transformation which maps the points(-1, 0, 1) into the points (0, i, 3i). 10M

14. A). Evaluate $\int_C \frac{z^3 - \sin 3z}{\left(z - \frac{\pi}{2}\right)^2} dz$, where $C : |z| = 2$ *and* $C : |z| = 1$ using Cauchy's integral formula. 10M

OR

14. B). Evaluate $\int_0^\infty \frac{1}{1 + x^4} dx$ using Cauchy – Residue theorem. 10M

15. A). Express the function $f(x) = x^2$ as Fourier series in $[0, 2\pi]$. 10M

OR

15. B). Find the Fourier integral transform of $f(x) = \begin{cases} 1 - x^2, |x| \le 1 \\ 0, |x| > 1 \end{cases}$ and hence evaluate $\int_0^\infty \frac{x\cos x - \sin x}{x^3} \cos\frac{x}{2} dx$. 10M

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H.T No: | | | | | | | | | | | **R22** | Course Code: A402205

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech III Semester Regular Examinations February-2024

Course Name: NETWORK ANALYSIS AND SYNTHESIS

(Electronics & Communication Engineering)

Date: 07.02.2024 AN **Time: 3 hours** **Max.Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries ONE mark. **10x1=10M**

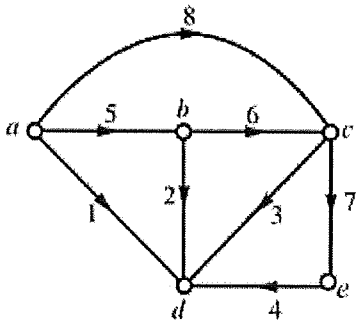
1. Mention some properties of a cut-set. 1 M
2. If a current leaves the dotted terminal of one coil, the reference polarity of the mutual voltage in the second coil is negative at the dotted terminal of the second coil. Is the statement TRUE/FALSE? 1 M
3. What is the relationship between bandwidth and quality factor for a RLC circuit? 1 M
4. Define selectivity and half-power frequency. 1 M
5. Write the relation between Z and Y parameters. 1 M
6. Which parameters are closely related to h-parameters? 1 M
7. What kind of filter can be used to select a signal of one particular radio station? 1 M
8. What is the difference between active filter and passive filter? 1 M
9. What is driving point impedance, write its transfer function. 1 M
10. What are the poles and zeros of the linear system described by the differential equation: 1 M

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

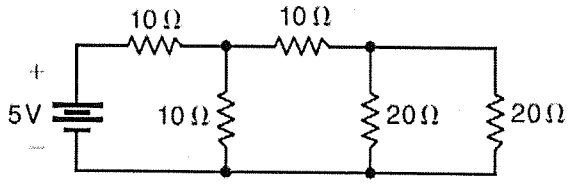
PART-B

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

11.A). i) Find out the incidence matrices for the graph given below. 5M



ii) Draw the graph of the circuit shown below and select a suitable tree to write tie-set matrix. 5M

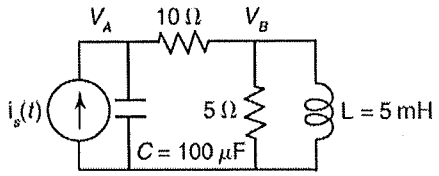


(P.T.O..)

OR

11. B). Drive the relationship between self-inductance (L), mutual inductance (M) and coefficient of coupling (K). 10M

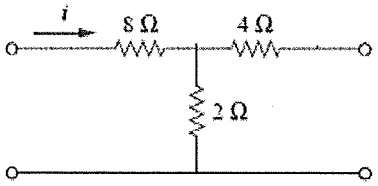
12. A). For the circuit, find the node voltages V_A and V_B using node voltage method. The source current is given as $i_s(t) = 10\cos(\omega t)$ A, $\omega = 1000$ rad/s. 10M



OR

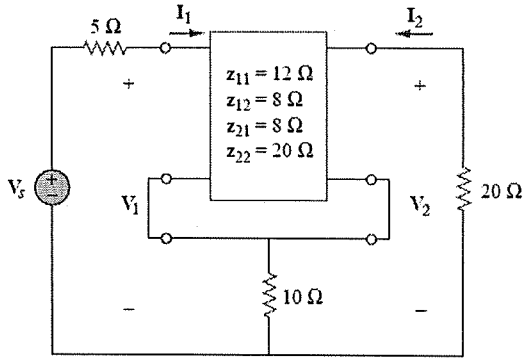
12. B). A series RLC circuit has the values: R 100, L 0.02 H, C 0.02 F. Calculate frequency of resonance. A variable frequency sinusoidal voltage of value 50 V is applied to the circuit. Find the frequency at which the voltage across L and C is the maximum. Also calculate voltage across L and C at frequency of resonance. Find the maximum current in the circuit. 10M

13. A). Determine the y parameters for the given two-port. 10M



OR

13. B). Evaluate V_2/V_S in the given circuit. 10M



14. A). What are attenuators? Explain about T,π,L and Bridge type attenuators. 10M

OR

14. B). i) Design a low-pass active filter with a deign impedance of 4 and a cutoff frequency of 500 Hz. 5M

ii) Design a high pass filter with a high-frequency deign impedance of 5 and a cutoff frequency of 2 kHz. Use a 0.1 μF capacitor in your design. 5M

15. A). Check whether the following polynomials are Hurwitz or not. 10M

i) $F(s) = s^4 + s^3 + 5s^2 + 3s + 4$

ii) $F(s) = s^7 + 2s^6 + 2s^5 + s^4 + 4s^3 + 8s^2 + 8s + 4$

OR

15. B). Find the first and second Cauer forms of LC networks for the impedance function: 10M

$$Z(s) = \frac{s^4 + 10s^2 + 9}{s^3 + 4s}$$

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H.T No: | | | | | | | | | | | R22 | Course Code: A404301

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech III Semester Regular Examinations February-2024

Course Name: ANALOG CIRCUITS

(Electronics & Communication Engineering)

Date: 09.02.2024 AN **Time: 3 hours** **Max.Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries ONE mark. **10x1=10M**

1. Mention typical values of h parameters in CC configuration. 1 M
2. Illustrate the effect of bypass capacitors in BJT amplifier. 1 M
3. Why gate junction of FET is always reverse biased? 1 M
4. Differentiate enhance mode and depletion mode of MOSFET. 1 M
5. Define Gain Bandwidth product. 1 M
6. Justify why h parameter model is not suitable to analyze transistor at high frequencies. 1 M
7. Classify the various negative feedback amplifiers. 1 M
8. Compare positive and negative feedback. 1 M
9. Compare RC phase shift and crystal oscillator. 1 M
10. What are the factors that affect the frequency stability of an oscillator? 1 M

PART-B

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

11.A). i) In a single stage CB – amplifier circuit, R_E = 20K, Rc = 10K, V_{EE} = -20V, Vcc = 20V, R_L = 10K. Find out Ri, Ro, Ai, Av and power gain in dB. 5M

ii) Draw and analyse the AC equivalent circuit of CE amplifier. 5M

OR

11. B). i) The h-parameters of CE-amplifier are hie = 1100Ω, hre = 2.5×10^{-4}, hfe = 50, 5M

hoe =24 μA/V and Rs = 1KΩ, RL = 10KΩ. Find out current and voltage gains with and without source resistance, input and output impedances. 5M

ii) Define and analyse base width modulation of CB configuration of BJT.

12. A). i) Draw and explain the CS amplifier with current source load. Derive an expression for Av. 5M

ii) Draw and explain the MOS small signal model. 5M

OR

12. B). i) Derive the expressions for higher and lower cut-off frequency of a multistage amplifier and mention inferences drawn from it. 5M

ii) Discuss the input and output characteristics of a folded cascode amplifier with NMOS input. 5M

(P.T.O.)

13. A). i) Discuss the MOSFET characteristics in depletion mode. 5M

ii) Derive the expression for input resistance of a Darlington pair circuit. What are the pros and cons of it. 5M

OR

13. B). i) Draw the circuit diagram of RC coupled amplifier. Explain the operation and analyse its frequency response. 5M

ii) A single stage CE amplifier is measured to have a voltage gain bandwidth fH of 5 MHz with RL=500 Ω. Assume hfe=100, gm=100 mA/V, rbb'=100Ω, CC=1pF and fT=400 MHz. (i) find the value of source resistance that will give the required bandwidth. (ii) with the value of Rs found in (i), find the mid band voltage gain V0/Vs. 5M

14. A). i) Show that for a current series feedback amplifier the input and output resistances are increased by a factor if (1+Aβ) with feedback. 5M

ii) Explain with the support of mathematical expressions, how the negative feedback in amplifiers increases amplifier bandwidth and reduces distortion in amplifiers. 5M

OR

14. B). i) Interpret current shunt and voltage shunt feedback amplifiers. 5M

ii) An amplifier requires an input signal of 60mV to produce a certain output with negative feedback to get the same output the required signal is 0.5V. The voltage gain with feedback is 90. Find the open loop gain and feedback factor. 5M

15. A). i) Derive the expression for frequency of oscillation of RC phase-shift oscillator and mention its significance. 5M

ii) Draw and explain the operation of Colpitt's oscillator and elaborate its applications. 5M

OR

15. B). i) Explain the principle of operation of the Wein bridge oscillator. Elaborate its applications. 5M

ii) In a transistorized Hartley oscillator, the two inductances are 2mH and 20μH while the frequency is to be changed from 950KHZ to 2050KHZ. Calculate the range over which the capacitor is to be varied. 5M

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H.T No: | | | | | | | | | | | **R22** | **Course Code: A404302**

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech III Semester Regular Examinations February-2024

Course Name: PROBABILITY THEORY AND STOCHASTIC PROCESSES

(Electronics & Communication Engineering)

Date: 12.02.2024 AN **Time: 3 hours** **Max.Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries ONE mark. **10x1=10M**

1. Write the conditions for a function to be a random variable. 1 M
2. Define probability with an example. 1 M
3. Write short notes on Chebychev's inequality. 1 M
4. Define Characteristic function and present generation of moments using it. 1 M
5. State central limit theorem for the case of equal distributions. 1 M
6. Write the properties of jointly Gaussian random variables. 1 M
7. What is a WSS random process? 1 M
8. Write short notes on Gaussian random process. 1 M
9. What is the expression for power spectral density? 1 M
10. Write short notes on SNR. 1 M

PART-B

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

11.A). Write about the Probability axioms? Explain with examples 10M

OR

11. B). A random variable X has the following probability function, then find a) K, b) the mean and (c) $P(0 < X < 5)$. 10M

X	0	1	2	3	4	5	6	7
P(X=x)	0	k	2k	2k	3k	K^2	$2k^2$	$7k^2+k$

12. A). Obtain the moment generating function of a uniformly distributed random variable. 10M

OR

12. B). Obtain the variance of Gaussian random variable. 10M

13. A). Define autocorrelation function of a random process. Write properties of auto correlation function of a WSS process and prove any three of them. 10M

OR

13. B). Classify random processes and explain. 10M

(P.T.O..)

14. A). Derive the relationship between cross-power spectrum and cross-correlation function. 10M

OR

14. B). Obtain the average power in the random process $X(t) = A\cos(\omega_0 t+1)$ is a random variable uniformly distributed in the range$\theta$are real constants and $(0, 2\pi)$. 10M

15. A). Write in detail the procedure of Shannon-fanno coding scheme. 10M

OR

15. B). Find out the Huffman encoding of the following message: 10M

Message X1 X2 X3 X4 X5 X6

Probability 0.4 0.32 0.08 0.08 0.08 0.04

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H.T No: | | | | | | | | | | | R22 | Course Code: A404303

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech III Semester Regular Examinations February-2024

Course Name: SIGNALS & SYSTEMS

(Electronics & Communication Engineering)

Date: 14.02.2024 AN | Time: 3 hours | Max.Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries ONE mark. 10x1=10M

1. Define signal. 1 M
2. Define unit step function. 1 M
3. Define Hilbert transform. 1 M
4. What is the advantage of Fourier transform. 1 M
5. What is step response. 1 M
6. Define correction of signals. 1 M
7. What is the Laplace Transform of impulse signal. 1 M
8. Define inverse Z-Transform. 1 M
9. What is aliasing. 1 M
10. Define parsevals theorem. 1 M

PART-B

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

11.A). Describe the concept of signal approximation using orthogonal functions and derive mean square error. 10M

OR

11. B). Explain the classification signals with example. 10M

12. A). Describe the following with necessary equations. 10M
i) Dirichlet conditions ii) Trigonometric Fourier series iii) Exponential Fourier series.

OR

12. B). Find the Fourier transform of the following. 10M
(i) $\cos\omega 0t\ u(t)$ (ii) $x(t)=e^{-a|t|}$ (iii) Gate function (iv) Impulse function

13. A). Explain Ideal LPF, HPF and BPF characteristics with neat sketches and relevant equations. 10M

OR

13. B). Consider a causal LTI system with frequency response $H(\omega)=1/4+j\omega$, for a input x(t), the system is observed to produce the output $y(t)=e^{-2t}u(t)- e^{-4t}u(t)$. Find the input x(t). 10M

(P.T.O..)

14. A). Discuss the following. 10M
i) ROC and Properties ROC of Laplace Transform ii) Relation between FT and LT

OR

14. B). Find the Z-transform and ROC for the following sequences. i) $x(n)=a^n u(n)$ 10M
ii) $x(n)= -b^n u(-n-1)$

15. A). State and Prove Sampling theorem for band limited signals using graphical and analytical methods. 10M

OR

15. B). Discuss the following: 10M
i) Auto correlation and cross correlation ii) Energy Density spectrum

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