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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. 10M  
 The relation between them are given in the following table

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  $1/3^{rd}$ . 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  $v(x, y) = x^2 - y^2 + x/(x^2 + y^2)$ , 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  $f(x) = \begin{cases} 1-x^2, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$  and hence evaluate 10M

$$\int_0^{\infty} \frac{x \cos x - \sin x}{x^3} \cos \frac{x}{2} dx.$$

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R22

Course Code: A402203



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

B.Tech III Semester Regular Examinations February-2024

Course Name: **ELECTRICAL CIRCUIT ANALYSIS-II**

(Electrical & Electronics 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

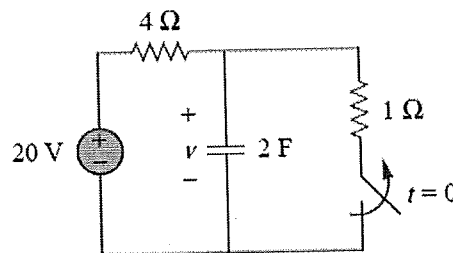
1. What is the time constant for an RC circuit with  $R = 2 \Omega$  and  $C = 4 \text{ F}$ ? 1 M
2. An RL circuit has  $R = 2 \Omega$  and  $L = 4 \text{ H}$ . What is the time needed for the inductor current to reach 40% of its steady-state value? 1 M
3. What is the main advantage of using Laplace Transform in circuit analysis? 1 M
4. What is the linearity property of Laplace transform? 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. Which conditions are necessary for a periodic function  $f(t)$  to yield a convergent Fourier series? 1 M
8. In which terms the exponential Fourier series of a periodic function  $f(t)$  describes the spectrum? 1 M
9. What kind of filter can be used to select a signal of one particular radio station? 1 M
10. What is the difference between active filter and passive filter? 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Calculate the capacitor voltage for  $t < 0$  and  $t > 0$  for each of the circuits given below. 10M



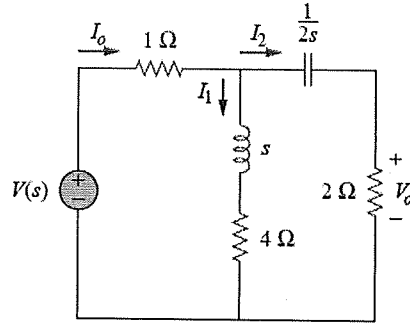
**OR**

11. B). A 50 Hz sinusoidal voltage of maximum value of 400 V is applied to a series RL circuit having  $R = 10 \Omega$  and  $L = 0.1 \text{ H}$ . Find the expression for value of the current at any instant after the voltage is applied, assuming the voltage is zero at the instant of application. Also calculate its value at 0.02 s after switching. 10M

(P.T.O.)

12. A). Determine the transfer function  $H(s) = V_o(s)/I_o(s)$  for the given circuits.

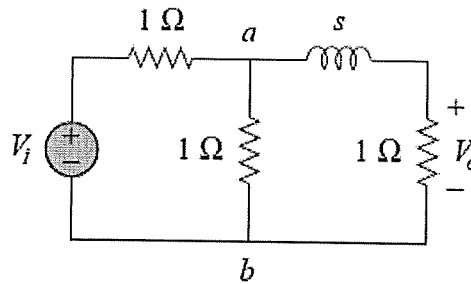
10M



OR

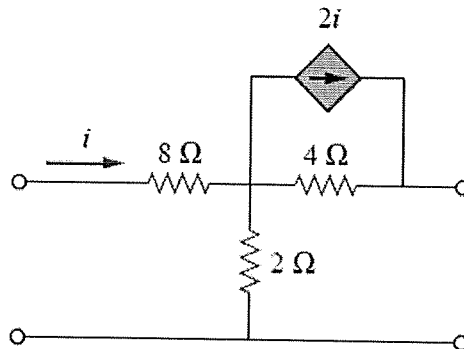
12. B). For the s-domain circuit given below, find (i) the transfer function  $H(s) = V_o/V_i$ , (ii) the impulse response.

10M



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

10M



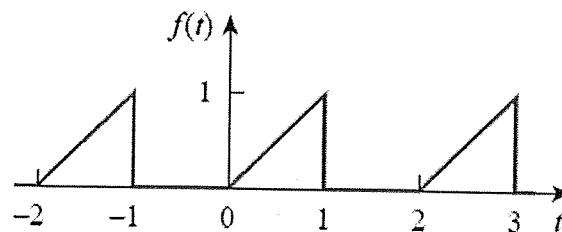
OR

13. B). Derive the ABCD parameters in terms of Z parameters.

10M

14. A). Obtain the Fourier series for the periodic function shown below and plot the amplitude and phase spectra.

10M

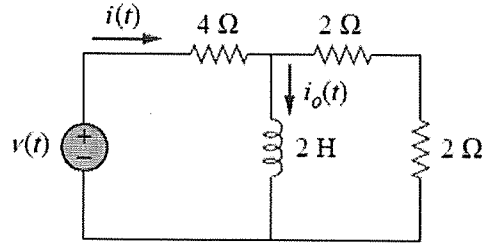


(P.T.O.)

OR

14. B). Find the response  $i_o(t)$  in the circuit given below if the input voltage  $v(t)$  has the Fourier series expansion: 10M

$$v(t) = 1 + \sum_{n=1}^{\infty} \frac{2(-1)^n}{1+n^2} (\cos nt - n \sin nt)$$



15. A). Design a constant K type high pass filter with necessary diagram and equations. 10M

OR

15. B). i) Design a low-pass active filter with a dc gain of 4 and a corner frequency of 500 Hz. 5M  
ii) Design a highpass filter with a high-frequency gain of 5 and a corner frequency of 2 kHz. Use a 0.1  $\mu$ F capacitor in your design. 5M

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**R22**

Course Code: A402302



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

B.Tech III Semester Regular Examinations February-2024

Course Name: **ELECTRO MAGNETIC FIELDS**

(Electrical & Electronics 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

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|--|-----|
| 1. Write down expression for x, y, z in terms of spherical co-ordinates r, $\theta$ and $\Phi$ . | 1 M |
| 2. What is a scalar quantity and vector quantity?  | 1 M |
| 3. State coulomb's law.  | 1 M |
| 4. Define electric field.  | 1 M |
| 5. Write the expression for boundary conditions of conductor in free space.                      | 1 M |
| 6. Define electric dipole moment.  | 1 M |
| 7. What is magnetic flux intensity   | 1 M |
| 8. State Biot-savart's law   | 1 M |
| 9. What is faraday's law of electro-magnetic induction?  | 1 M |
| 10. Write MAXWELL's equations for static fields representing Amperes law.                        | 1 M |

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). If  $\vec{A} = \vec{x} + \vec{y} + \vec{z}$ ,  $\vec{B} = -\vec{x} + 2\vec{y} - 3\vec{z}$ , find 10M
- Magnitude of  $\vec{AB}$
  - The projection of  $\vec{B}$  in the direction of  $\vec{A}$
  - The angle between  $\vec{A}$  and  $\vec{B}$

**OR**

11. B). Discuss the cylindrical coordinate system used to represent field vectors. Using cylindrical coordinate system find area of the curved surfaced of a right circular cylinder where  $r=20m$ ,  $h=5m$  and  $30^\circ \leq \phi \leq 120^\circ$  10M

12. A). Determine the expressions for electric field intensity and work done on point charge. 10M

**OR**

12. B). Demonstrate and prove Gauss law in conductors. Write its importance in electro-magnetic fields. 10M

13. A). Extract the expression for capacitance of the cylindrical condenser with inner and outer radii a and b. 10M

**OR**

13. B). A conducting wire of diameter 1mm and conductivity  $1 * 10^7$  ohm/m, has  $10^{16}$  free electrons/m<sup>3</sup> when an electric field of 10mV/m is applied. Determine 10M
- The charge density of free electrons
  - The current density
  - The current in the wire

(P.T.O.)

14. A). Derive the expression for magnetic field intensity due to infinite line conductor using Ampere circuital law. 10M

**OR**

14. B). A current of 1A is flowing in a circular coil of radius 10cm and 20 turns. Calculate the intensity of magnetic field at a distance 10cm on the axis of the coil and at the centre. 10M

15. A). Formulate the Maxwell's equation for Electric and Magnetic field in integral and differential forms for time varying fields. 10M

**OR**

15. B). A square loop of wire 25cm\* 25cm is placed in an alternating field with the maximum intensity of 1A/m. If the plane of the loop is perpendicular to the magnetic field and varying at a frequency of 10MHz. Find induced emf in the loop. 10M

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**R22**

Course Code: A402301

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

B.Tech III Semester Regular Examinations February-2024

Course Name: **ELECTRICAL MACHINES-I**

(Electrical &amp; Electronics 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. List the applications of Series D.C. Generator. 1 M
2. Mention the advantages of compensating winding in the armature. 1 M
3. Draw the torque Speed characteristics of D.C Series motor. 1 M
4. Mention the different methods to control speed of D.C. motor. 1 M
5. List different types of tests performed on D.C. Motor. 1 M
6. Mention the limitations of Brake test on D.C. Motor. 1 M
7. Draw the phasor diagram for 1- Phase Transformer under lagging power factor. 1 M
8. Draw the equivalent circuit diagram of 1- Phase Transformer. 1 M
9. List the major advantage of sumpter's test. 1 M
10. List the conditions to operate two transformers in parallel. 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Explain the effect of Armature Reaction and reduction procedures. 10M

**OR**

11. B). The magnetization characteristics for a 4-pole, 110-V, 1000 R.P.M shunt generator is as follows: 10M

Field Current	0	0.5	1	1.5	2	2.5	3 A
O.C Voltage	5	50	85	102	112	116	120 V

Armature is lap wound with 144 conductors. Field resistance is 45 ohms. Determine (i) voltage the machine will build up at no load, (ii) the critical resistance, (iii) the residual voltage per pole.

12. A). Explain the operation of Three point starter with neat diagram. 10M

**OR**

12. B). A 4-pole 250-V D.C. shunt motor has a lap-connected with 960 conductors. The flux per pole is
- $2 \times 10^{-2}$
- Wb. Calculate the torque developed by the armature and the useful torque in newton-meter when the current taken by the motor is 30A. The armature resistance is 0.12 ohms, and the field resistance is 125 ohms. The rotational losses amount is 825 W. 10M

(P.T.O..)



13. A). Elaborate the procedure to conduct Swinburne's Test. 10M
- OR**
13. B). Elaborate the procedure to conduct Brake Test. 10M
14. A). Derive the E.M.F equation of a 1-phase Transformer. 10M
- OR**
14. B). A 100KVA, 1100/220V, 50Hz, single phase transformer has a leakage impedance of  $(0.1+0.4j)$  ohm for the H.V winding and  $(0.006 + 0.015j)$  ohm for the L.V winding. Find the equivalent winding resistance, reactance and impedance referred to H.V and L.V sides. 10M
15. A). Elaborate the procedure to conduct Sumpner's Test. 10M
- OR**
15. B). Explain the OC & SC test on single phase transformer. 10M

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**R22**

Course Code: A402303



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

B.Tech III Semester Regular Examinations February-2024

Course Name: **POWER SYSTEM-I**

(Electrical & Electronics 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. What are the various types of turbines used for hydro stations? 1 M
2. What is a nuclear reactor? 1 M
3. What is transposition? Why is it done? 1 M
4. What is the use of an insulator? 1 M
5. What is a radial distribution system? 1 M
6. How do you classify distribution systems? 1 M
7. How does AC distribution differ from DC distribution? 1 M
8. What is the difference between three phase, three wire and three phase, four wire distribution systems? 1 M
9. What are the costs that go unto the generation of electrical energy? 1 M
10. Define the maximum demand. 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Draw a typical layout of a gas turbine power plant and describe the function of different components of their plant? 10M

**OR**

11. B). Compare salient features of the following power plants i) Hydro ii) Steam power plant. 10M
12. A). Find the Inductance per conductor of a three phase line, when the conductors are in the same plane? 10M

**OR**

12. B). A string of six insulator units has mutual capacitance 10 times the capacitance to ground. Determine the voltage across each unit as a fraction of the operating voltage. Also determine the string efficiency? 10M
13. A). A two wire DC distributor 300m long is uniformly loaded with 3 A/m. The resistance of single wire is 0.03 ohm/Km. If the distributor is fed at one end, Calculate i) the voltage drop up to a distance of 200m from the feeding point ii) maximum voltage drop 10M

**OR**

13. B). Distinguish between radial and ring distribution systems. 10M

(P.T.O.)

14. A). Discuss various bus bar systems for distribution networks. 10M
- OR**
14. B). A three phase, four wire 400 volts system feeds a balanced load of 4801 KW at power factor 0.8 and loads of 50 KW, 150 KW and 200 KW at unity power factor when connected between respective phase. Determine the current in each line and in the neutral wire of the system? 10M
15. A). Explain the following terms i) load factor ii) diversity factor iii) demand factor iv) Tariff on charge to customer v) Connected load. 10M
- OR**
15. B). What are the load curves and load duration curves? Discuss their utility in the economics of generation? 10M

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