

**3RD SEM. /AE & IE / ELE.& MECH/ EEE/ ELE. / EE(I & C)/ ETC& COMM./
E & TC/ 2023(W) NEW**

Th-1 Engineering Mathematics-III

Full Marks: 80

Time- 3 Hrs

**Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks**

1. Answer **All** questions 2 x 10
 - a. Find the value of $(\omega + \omega^2)^{97}$ where ω is the cube root of unity.
 - b. Find the value of $A + 2B$, where $A = \begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ 1 & -2 \end{bmatrix}$
 - c. Write down the formula for Simpson's $\frac{1}{3}$ rule having space width is h
 - d. Form a partial differential equation by eliminating arbitrary constant of $Z = ax + by$
 - e. Find C.F if $D^2y + 5Dy + 6y = 0$
 - f. Explain Interpolation with an example.
 - g. State Linearity property of Laplace Transforms
 - h. Define even function with an example
 - i. Evaluate $\Delta(x + \cos x)$
 - j. Find $L(e^{3t}t^2)$
2. Answer **Any Six** Questions 5 X 6
 - a. Find Rank of matrix $\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$
 - b. Solve $\frac{d^3y}{dx^3} - y = 0$
 - c. Find the Laplace transforms of $t \cos^2 t$
 - d. Find root of equation $x^3 - 2x - 5 = 0$ upto 4 stages which lies between 2 and 3 by using Bisection method.
 - e. If $x + \frac{1}{x} = 2 \cos \theta$, then show that $x^n + \frac{1}{x^n} = 2 \cos n\theta$
 - f. Prove that $\Delta\{\log f(x)\} = \log\left\{1 + \frac{\Delta f(x)}{f(x)}\right\}$

- g Using Inverse Lagrange's Interpolation formula , find the value of x when $y = 15$ from the following data
- | | | | | |
|-----|----|----|----|----|
| x | 5 | 6 | 9 | 11 |
| y | 12 | 13 | 14 | 16 |
- 3 Expand $F(x) = |x|$ as a fourier series in the interval $-\pi \leq x \leq \pi$, Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} \dots = \frac{\pi^2}{8}$ 10
- 4 a) Applying Newton's Forward Interpolation formula, find a cubic polynomial from the following data. $\begin{array}{c} x \quad 0 \quad 1 \quad 2 \quad 3 \\ y \quad 1 \quad 2 \quad 1 \quad 10 \end{array}$ 5
- b) Find the square root of $3 + 4i$ 5
- 5 a) Solve $(D^2 - 3D + 2)y = e^{3x} + \sin 2x$ 5
- b) Find the value of y when $x = 10$ from following data $\begin{array}{c} x \quad 5 \quad 15 \quad 25 \quad 35 \\ y \quad 9 \quad 30 \quad 35 \quad 42 \end{array}$ 5
- 6 a) Integrate Numerically $\int_0^6 \frac{dx}{1+x^2}$, using Trapezoidal Rule taking $h = 1$ 5
- b) Find $L^{-1} \left(\log \frac{s+1}{s+2} \right)$ 5
- 7 Solve $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$ 10

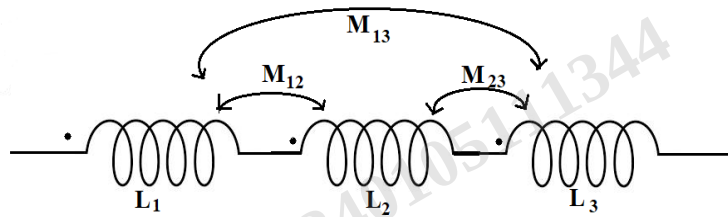
Th-2 Circuit & Network Theory

Full Marks: 80

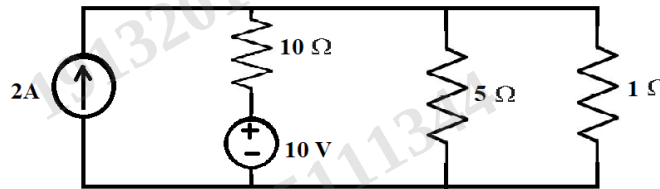
Time- 3 Hrs

**Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks**

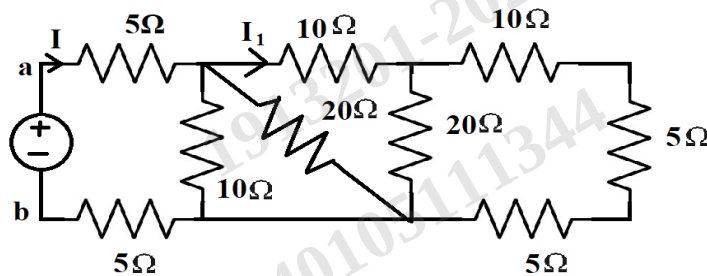
1. Answer **All** questions 2 x 10
 - a. What are bilateral and unilateral elements and give some examples.
 - b. State KCL and KVL.
 - c. State Thevenin's theorem.
 - d. State different powers and draw the power triangle.
 - e. State the condition for maximum power to be transferred in the circuit. Write down the expression of maximum power.
 - f. Define quality factor.
 - g. Define coefficient of coupling.
 - h. Write down the condition for series resonance and the expression of frequency.
 - i. State the open circuit parameters of a two port network.
 - j. Define filter. Write down the types of filters
2. Answer **Any Six** Questions 6 x 5
 - a. Explain B-H curve briefly with a neat diagram.
 - b. Give a comparison between magnetic circuit and Electric circuit.
 - c. Find the total inductance of the three series connected coupled coils as shown in the figure. Given: $L_1 = 1\text{ H}$, $L_2 = 2\text{ H}$, $L_3 = 5\text{ H}$, $M_{12} = 0.5\text{ H}$, $M_{23} = 1\text{ H}$, $M_{13} = 1\text{ H}$.



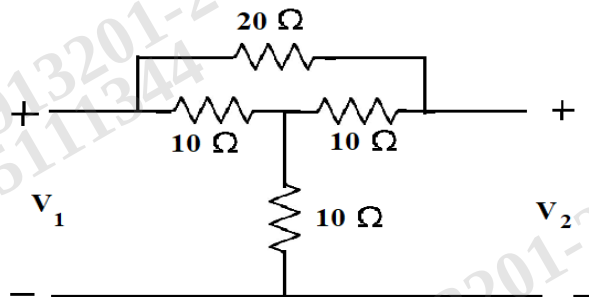
- d. Find the power loss in 1 ohm resistor by Thevenin's theorem.



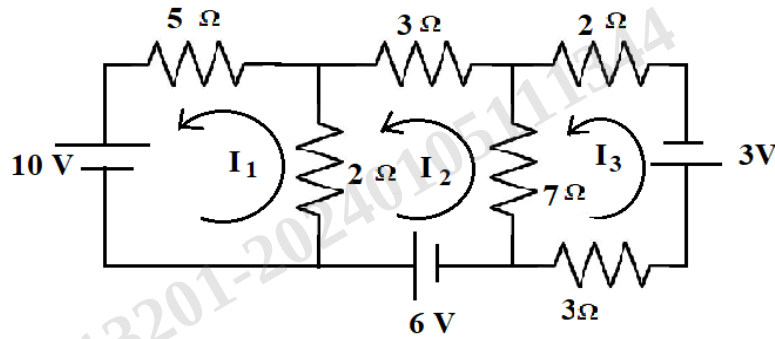
- e. What are the properties of resonance?
- f. A coil having resistance of 10 ohm and inductance of 1H is switched on to a direct voltage of 100 volt. Calculate the rate of change of the current (a) at the instant of closing the switch (b) when $t = L/R$.
- g. Find the value of I_1



- 3 Find the Z-parameters of the circuit as shown in the figure. 10

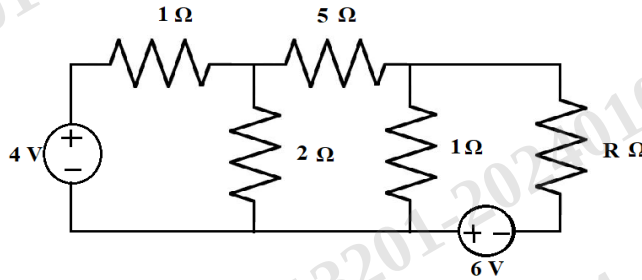


- 4 Find I_1, I_2 and I_3 by using Mesh analysis. 10



- 5 Derive the relation between phase and line quantities in star and Delta Connection of a 3-phase circuit. 10

- 6 Find the value of 'R' in the circuit of figure as shown below such that maximum power transfer takes place. What is the amount of this power? 10



- 7 Design a constant k-low pass filter(both II and T) having $f_c = 2\text{KHz}$ and design impedance $R_0 = 600\Omega$. Obtain the value of attenuation at 4 kHz. 10

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Th-3 Elements of Mechanical Engineering

Full Marks: 80

Time- 3 Hrs

**Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks
Use of Steam Table and Mollier Diagram is allowed**

1. Answer **All** questions 2 x 10
 - a. State first law of thermodynamics.
 - b. What is the function of water level indicator of a boiler.
 - c. Define boiler accessories with example.
 - d. Petrol engine works in which cycle and write down its efficiency in mathematical formula.
 - e. Define reaction turbine with examples.
 - f. Define dryness fraction of steam and what is the value of dryness fraction of steam for dry saturated steam?
 - g. What is the function of Hydraulic Ram?
 - h. Define heat and its unit.
 - i. What is mean effective pressure of a steam engine?
 - j. What are the pressure measuring instruments?
2. Answer **Any Six** Questions 6 x 5
 - a. Describe properties of fluid.
 - b. Compare between Jet condenser and surface condenser.
 - c. How boilers are classified ?
 - d. Derive an expression to determine hypothetical mean effective pressure of a steam engine without clearance.
 - e. Differentiate between two stroke and four stroke engine.
 - f. Differentiate between impulse turbine and reaction turbine.
 - g. Explain U-tube manometer and piezometer.
3.
 - a. Define Bore. 2
 - b. Determine the stroke and diameter of double acting steam engine cylinder developing 180kw under the following conditions. 8
Initial steam pressure 7bar
Back pressure 1.12bar
Crank speed 100r.p.m.
Average piston speed 135m/min
Diagram factor 0.8
Cut-off at 0.4 of the stroke.

- 4 State and prove Bernoulli's Theorem. 10
- 5 Steam is being generated in a boiler under a pressure of 12bar. Find the enthalpy 10
5kg of steam. When
- (i) Steam is wet having dryness fraction of 0.75.
 - (ii) Steam is dry and saturated
 - (iii) Temperature of steam is 300°C . Take $C_p = 2.1\text{KJ/kg}\cdot^{\circ}\text{C}$.
- 6 (a) Explain two stroke diesel engine with neat sketch. 10
(b) What is the function of Hydraulic lift and describe working principle of Hydraulic lift with neat sketch.
- 7 (a) What is the difference between pascal and bar. 2+8
(b) With a neat sketch explain construction and working of Cochran boiler.

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Th- 4 Electrical Engineering Material

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
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1. Answer **All** questions 2 x 10
- Define reluctance and coercivity.
 - What is dielectric strength and dielectric loss in insulators?
 - Define eddy current.
 - Write down two applications of copper.
 - What is superconductor?
 - What is the effect of porosity?
 - What are the advantages of using bundled conductors?
 - What do you mean by covalent bond?
 - What is ageing?
 - Why conducting materials like copper and aluminium are not used for making the element for electrical heaters?
2. Answer **Any Six** Questions 6 x 5
- What is the difference between N type semiconductor and P type semiconductor?
 - Write down properties of gold and silver.
 - What is fuse? Write down the properties of fuse material.
 - Define Plastics and give its classifications with applications.
 - Name the conducting materials used in making
 - Thermo-couple
 - Starter element used in starting d.c. motor
 - Electrodes for electric arc furnace
 - Plug and socket
 - Element of a fan regulator
 - Write in brief about photovoltaic cell.
 - Write short notes on Bimetals and their applications.
- Answer Any **Three** Questions
- 3 Explain the hysteresis loop for ferromagnetic material with suitable diagram. 10
- 4 Explain the process of polarisation of a dielectric material. 10
- 5
 - Distinguish between low resistivity and high resistivity materials. 10
 - Explain the effect of temperature on resistivity.
- 6 Explain physical, thermal and electrical properties of insulating materials. 10
- 7 Write short notes on 10
 - Hall effect generators
 - Magnetostriction

3RD SEM./ COMMON TO ALL /2023(W) NEW

Th-5 Environmental Studies

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Write down two effects of deforestation.
 - b. Differentiate between renewable and non-renewable energy sources.
 - c. Write down two effects of modern agriculture methods on environment.
 - d. Define decomposers in eco system.
 - e. What are the types of biodiversity?
 - f. Define ozone layer depletion.
 - g. Write down two causes of air pollution in urban areas.
 - h. What is endangered species?
 - i. Explain 3'R's in waste management.
 - j. What are the various objectives of family welfare programme?

2. Answer **Any Six** Questions 6 x 5
 - a. Discuss how urbanisation affects environment.
 - b. Give a brief description of man wild life conflict.
 - c. What are the methods protecting soil from erosion.
 - d. Define rainwater harvesting? State main objective of rain water harvesting?
 - e. Discuss how marine pollution affects aquatic animals.
 - f. Write down the role of an individual protecting environment.
 - g. Write about the disaster management procedures during cyclone.

Answer Any Three Questions

3. Define dam. Discuss the environmental and social impacts during construction of dam. 10
4. Define bio diversity and explain about bio geographical classifications in India. 10
5. Describe pond eco-system. 10
6. Write down the cause, effect and control of water pollution. 10
7. Write short notes on 10
 - a. Value of education
 - b. Solid waste management