

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – June 2023

Programme Name: B Tech (ME)
Semester: Second

Subject Code: UG11T4202

Subject Name: Basic Electrical Engineering

Date: 29.05.2023 Max Marks: 70
 Duration: 03 Hrs Pass Marks: 35

General Instructions

All Sections (A, B & C) are to be attempted.

Section A – (10 X 01 Marks)

1. Which of the following law is applied at any closed loop of an electrical circuit?
 a. Lenz's law b. power law
 c. Kirchoff's voltage law d. Ohm's Law
2. If a 220 V heater is used on 110 V supply heat produced by it will be _____ as much.
 a. One-half b. Twice c. One-fourth d. Four times
3. The average power supplied to a capacitor over one complete alternating current cycle is _____
 a. $V \cdot I$ b. V^2/X_c c. 0 d. $-V^2/X_c$

where X_c is capacitive reactance

4. For a given line voltage, four heating coils will produce maximum heat when connected
 a. all in parallel b. all in series c. with two parallel pairs in series
 d. one pair in parallel with the other two in series
5. Two heaters, rated at 1000 W, 250 volts each, are connected in series across 250 Volts 50 Hz AC mains. Total power drawn from the supply would be _____ W.
 a. 1000 b. 500 c. 250 d. 2000
6. Clamp meter is mainly used for measurement of
 a. high voltage b. high resistance c. high current d. capacitance
7. Digital multimeter is used for measurement of
 a. AC and DC Voltage b. AC and DC Current
 c. Resistance and continuity d. All of these

8. An inductive coil has a resistance of 5 ohms and an inductive reactance of 5 ohms. The impedance of the coil will be _____
 a. 5 ohms b. 10 ohms c. 7.07 ohms d. 0.707 ohms

9. The power-factor of a pure capacitive circuit is _____
 a. unity b. zero lagging c. zero leading d. 0.8 lagging

10. Example of insulator is _____
 a. Copper b. Aluminium c. Silicon d. Rubber

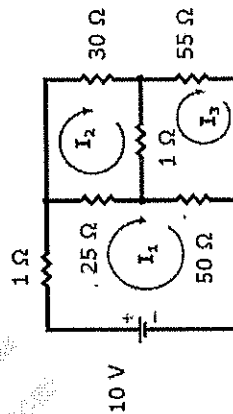
Section B – (05 X 02 Marks)

11. For a coil that has an inductance of 5H and a DC resistance of 10 Ω : Calculate the RL time constant.
12. Two coils are connected in parallel across a voltage of 250 V. The total current drawn is 20 A. Find the resistance of each coil when the power dissipated in one of the coils is 1000 Watts.
13. 4A current flowing through an inductive coil of inductance 20mH is reversed in 0.1s, calculate the average induced e.m.f.
14. Sketch and briefly explain load characteristics of ideal constant voltage source.
15. Sketch neatly B – H curve for a coil.

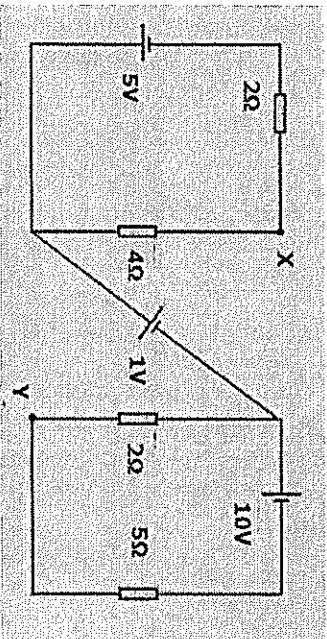
Section C – Answer Any 5 (05 X 10 Marks)

16. (a) Three resistors 6 Ω , 8 Ω and 10 Ω are connected in parallel. The total current flowing through the circuit is 10 A. Find the total resistance and current through each resistor. Also find the voltage across the parallel combination. (6 Marks)
- (b) A copper wire has a resistance of 6 Ω . What will be the resistance of another wire of same material, having twice the length and half of the cross-sectional area of the given wire. (4 Marks)

17. Determine the Loop currents I_1 , I_2 and I_3 , in the circuit given under, by applying Kirchoff's Laws. (10 Marks)



18. (a) Find the voltage drop across the terminals X-Y of the figure given below: (6 Marks)



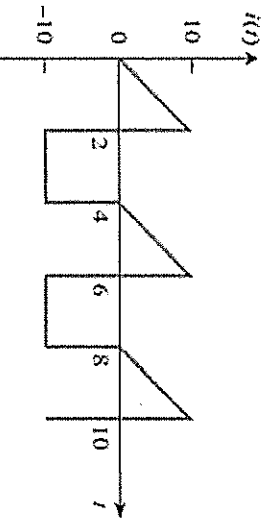
(b) The equation of an alternating voltage is given by $v = 200 \sin 314t$. Find the Mean value as well as the RMS value. (4 Marks)

19. When a voltage of 100 V at 50 Hz is applied to a choking coil A, the current taken is 8 A and the power dissipated is 120 W. When the same is applied to coil B, the current is 10 A and power dissipated is 500 W. What current and power will be taken when 100 V at 50 Hz is applied to the two coils connected in series? (10 Marks)

20. (a) Derive the expression for motional EMF induced in a conductor moving in a uniform magnetic field. (5 marks)

(b) A series circuit with $R = 10 \Omega$, $L = 50 \text{ mH}$ and $C = 100 \mu\text{F}$ is supplied with 200 V/50 Hz. Calculate (i) inductive reactance (ii) capacitive reactance (iii) impedance (iv) current (v) power factor (10 Marks)

21. Determine the rms value of the current waveform. If the current is passed through a resistor, find the average power absorbed by the resistor



22. Why is it necessary to regularly check insulation resistance? Discuss with neat sketch working of insulation tester. Also mention precautions to be taken while using insulation tester. (3+4+3 Marks)