

Indian Maritime University
(A Central University, Govt of India)
Supplementary Examinations – March/April 2025
Programme Name: B Tech (ME)
Semester: II
Subject Code: UG11T4202
Subject Name: Basic Electrical Engineering

Date: 15.03.2025

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
(ii) Options, if any, are specified in respective section.

Section A (10X1=10 Marks)

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. The commercial unit of electrical energy is _____.
a. kWh b. Watts c. Joules d. Calories
2. The specific conductance or conductivity of a material is expressed in _____.
a. ohm b. mho c. ohm-m d. mho/m
3. Kirchoff's first law i.e., $\sum i = 0$ at a junction, is based on the law of conservation of _____.
a. Energy b. Momentum c. Speed d. Charge
4. A current of 10 A flows through a resistor and the power dissipated by the resistor is 100 watts. The potential difference across the resistor is _____.
a. 1000 V b. 10 V c. 1 V d. 100 V
5. The power consumed in a circuit element will be maximum when the phase difference between the current and voltage is _____ degrees.
a. 0 b. 30 c. 45 d. 60
6. Form Factor is the ratio of
a. Average value to r.m.s. value b. Average value to peak value
c. r.m.s. value to average value d. r.m.s. value to peak value
7. An emf of 10 V is produced by self-inductance, when the current changes at a steady rate of 2A to 1A in 2 ms. The value of self-inductance is _____.
a. 5 mH b. 10 mH c. 20 mH d. 50 mH

8. An inductive coil has an impedance of 5 ohms with an inductive reactance of 4 ohms. The resistance of the coil is _____.
- a. 1 ohm b. 3 ohms c. 6.4 ohms d. 9 ohms
9. Power-factor is the ratio of
- a. active power to apparent power b. active power to reactive power
c. reactive power to apparent power d. reactive power to active power
10. What is the current of an element in Ampere, which produces 1440 Joules of heat in 4 seconds when the resistance of 10 ohms is applied to it?
- a. 6 b. 8 c. 4 d. 2

Section B

(5X2=10 Marks)

Five Questions of 02 Marks each

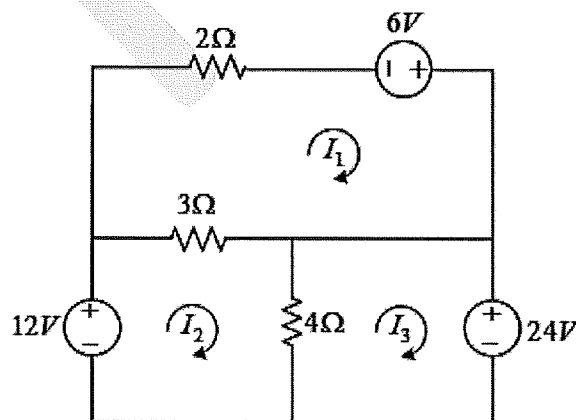
11. List any 2 conducting and insulating materials.
12. What is meant by impedance of a coil? How will you express it in rectangular form?
13. Describe Faraday's law of electromagnetic induction.
14. Three resistors $2\ \Omega$, $4\ \Omega$, and $6\ \Omega$ are connected in series. If the applied voltage across this combination is 36 V, find the voltage drop across each resistor.
15. Find the maximum and RMS values of an AC sinusoidal voltage, whose instantaneous value in Volts is $20 \sin \omega t$.

Section C

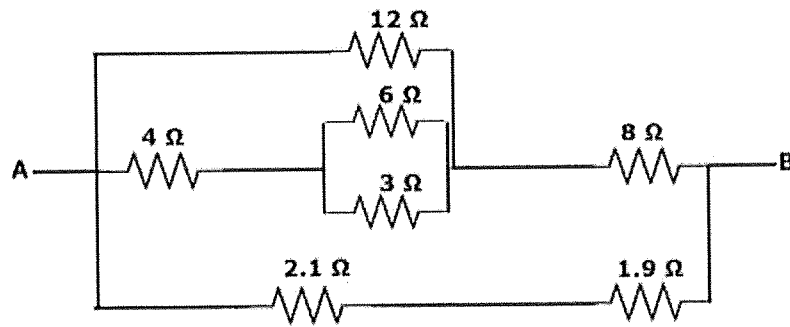
Seven Questions of 10 Marks each of which any 05 questions to be answered.

(5X10=50 Marks)

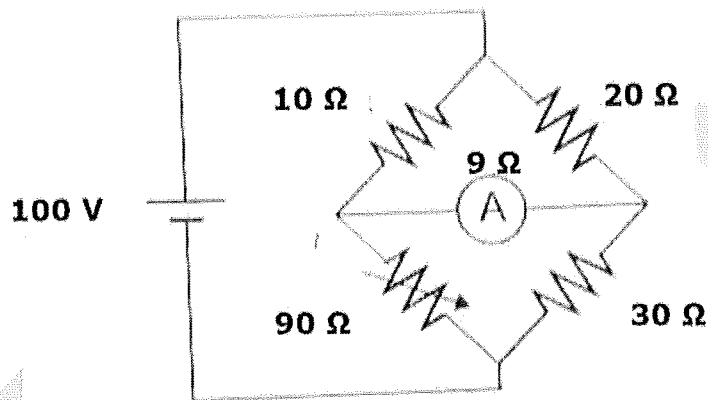
16. Find the Loop currents I_1 , I_2 and I_3 in the circuit given below. Use Kirchhoff's Laws. (10 Marks)



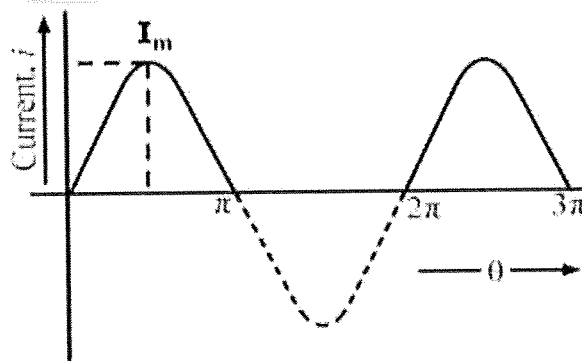
17. (a) Calculate the total resistance of the network between points A and B of the circuit shown below. (6 Marks)



- (b) Two coils in series have a resistance of 18Ω and when connected in parallel have a resistance of 4Ω . Find the value of resistances. (4 Marks)
18. For the network shown in the figure below, determine the current through the ammeter A having a resistance of 9Ω . (10 Marks)



19. (a) Prove that the RMS value of half-wave rectified AC sinusoidal current is $I_m/2$. (6 marks)



Current flows from the source to the load only when $\theta = 0$ to π & 2π to 3π

- (b) Deduce the expression $e = Blv$, (where B is the magnetic flux density in Wb/m^2 , l is the effective length of the conductor in m , and v is the linear velocity in m/sec) when the conductor is moving at right angles to the stationary magnetic field, from basic principles of electromagnetic induction. (4 Marks)

20. Discuss in detail the working and operating principle of any one type of clamp meter. (10 Marks)

21. (a) Two coils A and B lie in parallel planes. Coil A has 15000 turns and coil B has 12000 turns. 55% of flux produced by coil A links coil B. A current of 6 A in coil A produces 0.05 mWb, while the same current in coil B produces 0.08 mWb. Calculate the mutual inductance and the coupling coefficient. (6 Marks)

(b) A wire having a length of 1 m moves at right angles to its length at 50 m/sec in a uniform magnetic field of 1 Wb/m^2 . Determine the emf induced in the conductor when the direction of motion is (i) at right angles to the field (ii) inclined at 30° to the direction of the field. (4 Marks)

22. An inductive coil takes 10 A and dissipates 1000 W, when connected to a supply at 250 V, 25 Hz. Calculate the impedance, the effective resistance, the reactance, the inductance and the power factor. (10 Marks)