Indian Maritime University

B Tech (ME)

June 2022 End Semester Examinations

UG11T4202 – Basic Electrical Engineering

70 Marks

Pass Marks – 35

Duration – 03 Hours

Date – 21.06.2022

Part A – (10 X 01 Mark)

1.(i) The Energy generated while transferring $144x10^3$ C in 2 hours through a potential difference of 50 V is _____

a. 2 kWh b. 0.2 kWh c. 20 kWh d. 200 kWh

(ii) In all conductors, the resistance _____ with increase in temperature.

a. increases linearly b. decreases linearly c. remains same

d. increases in a non-linear manner

(iii) Two resistances of 3 Ω and 2 Ω are connected in series and this combination is connected across a battery, which supplies 5 V. If the current through the 3 Ω resistor is 1 A, what will be the current flowing in 2 Ω resistor?

a. 0.2 A b. 1.2 A c. 1 A d. 0.5 A

(iv) Which of the following law is applied at any node of an electrical circuit?

a. Ohm's law b. Coulomb's law c. Kirchhoff's current law

d. Lenz's law

(v) The unit of reactance is _____

a. Siemens b. Ohms c. Henry d. Farad

(vi) The ratio of peak value to the RMS value of current for an AC sine wave will be _____.

a. 1.414 b. 1.11 c. 0.9009 d. 0.707

(vii) For the given reluctance, the self-inductance of a coil is _____, where 'N' represents the number of turns of the coil.

a. directly proportional to N^2 b. directly proportional to N
c. inversely proportional to N d. inversely proportional to N^2

(viii) An inductive coil has a resistance of 6 ohms and an inductive reactance of 8 ohms. The magnitude of the impedance of the coil will be _____.
a. 6 Ω b. 10 Ω c. 8 Ω d. 14 Ω

(ix) The power-factor of a pure inductive circuit is _____.
a. unity b. zero lagging c. zero leading d. 0.8 lagging

(x) The rate at which work is done in an electric circuit is referred as _____.
a. voltage b. energy c. current d. power

Part B – (05 X 02 Marks)

2.(i) Three resistors of 12 Ω, 3 Ω, and 4 Ω are connected in parallel. What voltage must be applied to the group in order that total power of 96 W may be absorbed?

(ii) Why is AC preferable over DC on-board a ship?

(iii) Three resistors 4 Ω, 12 Ω, and 6 Ω are connected in parallel. If the total current taken is 12 A, find the current through each resistor.

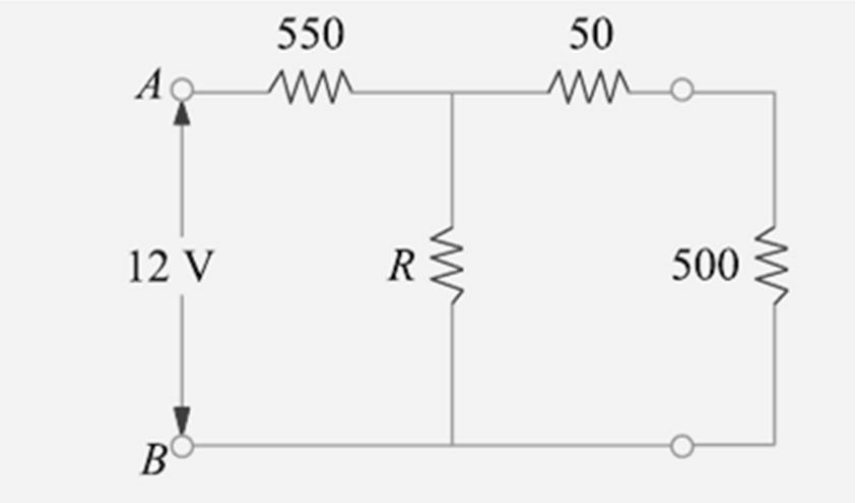
(iv) State Fleming's Right-Hand Rule to determine the direction of induced current.

(v) An alternating current of 60 Hz has a maximum value of 120 A. write down the equation for its instantaneous value.

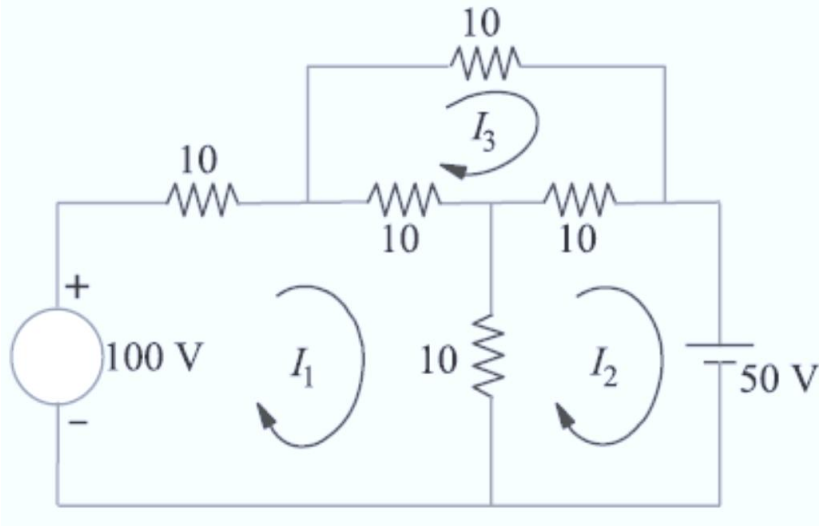
Part C –Answer Any 5 (05 X 10 Marks)

3(a) An aluminium wire 7.5 m long is connected in a parallel with a copper wire 6 m long. When a current of 5 A is passed through the combination, it is found that the current in the aluminium wire is 3 A. The diameter of the aluminium wire is 1 mm. Determine the diameter of the copper wire. Resistivity of copper is 0.017 μΩ-m; that of the aluminium is 0.028 μΩ-m. (5 Marks)

(b) Find the value of unknown resistance 'R' given in the figure. Take the voltage drop across 500 Ω as 2.5 volts. All the resistances are in ohm. (5 Marks)



4. Apply loop current method to find the mesh currents I_1, I_2, and I_3 in the circuit shown in figure. (10 Marks)



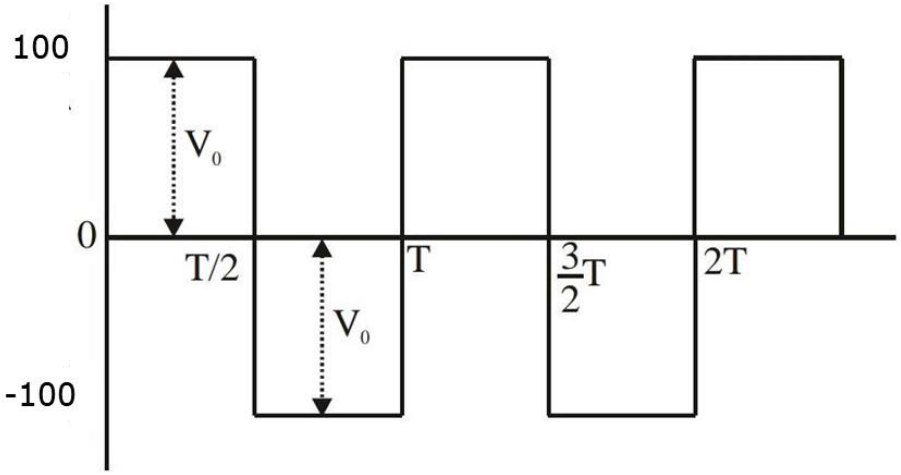
5.A Wheatstone bridge ABCD has the following details: AB = 1000 Ω; BC = 100 Ω; CD = 450 Ω; DA = 5000 Ω. A galvanometer of 500 Ω is connected between B and D. A 4.5-volt battery of negligible resistance is connected between A and C with A positive. Find the magnitude and direction of galvanometer current. (10 Marks)

6.Explain how a simple loop generator can be used to generate a single phase AC waveform using a neat schematic. (10 Marks)

7. (a) When an inductive coil is connected across a 250 V, 50 hz supply, the current is found to be 10 A and the power absorbed is 1.25 kW. Calculate the impedance, the resistance and inductance of the coil. A capacitor which has a reactance twice that of the coil is now connected in series with the coil across the same supply. Calculate the potential difference across the capacitor. (7 Marks)

(b) Calculate the admittance G + jB if the impedance is 6 + j8 ohms. (3 Marks)

8.(a) Prove that the peak factor of the given waveform is unity. (4 Marks)



(b) Two coupled coils have a coefficient of coupling, 0.85. N_1 = 100 turns and N_2 = 800 turns. With coil 1 open and a current of 5 A in coil 2, the flux φ_2 is 0.35 mWb. Find the self-inductance of each coil and the mutual inductance. (6 marks)

9.Discuss in detail the working of insulation tester using a neat sketch. (10 Marks)