Department of Electrical Engineering
Motilal Nehru National Institute of Technology, Allahabad
END SEMESTER EXAM
B. Tech 3rd Semester, Chemical and Production Engg.
(EE-1305) Basic Electrical & Electronics

Duration: 3 Hr | Date: 29th November, 2016 | M.M.60

Question No.1

In the circuit shown in Fig 1, what will be the value of RL to get the maximum power? What is the maximum power delivered to the load? [6]

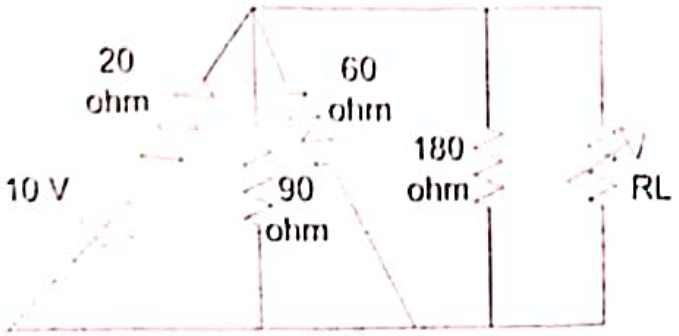

Fig. 1

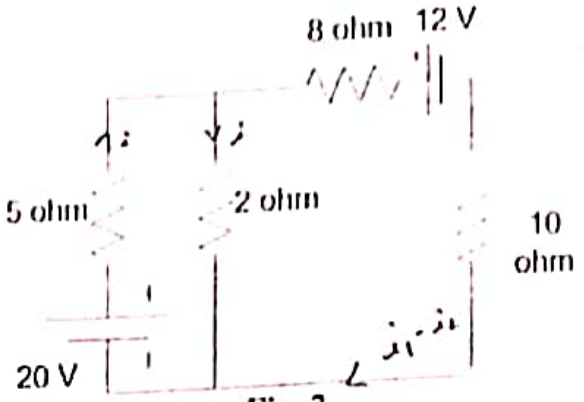

Fig. 2

Question No. 2

State and proof the Thevenin's theorem. For the circuit shown in Fig 2, calculate the current in the 10 ohm resistance using Thevenin's theorem. [6]

Question No. 3

a) When a certain inductive coil is connected to a d.c. supply at 240 V, the current in the coil is 16 A. When the same coil is connected to an a.c. supply at 240 V, 50 Hz, the current is 12.27 A. calculate: (i) the resistance; (ii) the impedance; (iii) the reactance; (iv) the inductance, of the coil. [4]

b) If the supply frequency were to be altered to 60 Hz at 240 V, would the current in the coil be greater or less than the value given above? Give reasons for your answer. [2]

Question No. 4

a) A large coil of inductance 1.405 H and resistance 40 ohm is connected in series with a capacitor of capacitance of 20 μF. Calculate the frequency at which the circuit resonates. If a voltage of 100 V is applied to the circuit at resonant condition, calculate the current drawn from the supply and the voltage across the coil and the capacitor. [4]

b) A series RLC circuit has R=10 ohm, L=0.1H and C=8μF. Determine (a) the resonant frequency, (b) Q-factor of the circuit at resonance, and (c) the half-power frequencies. [2]

Question No. 5

Three identical resistors of 20 ohm are connected in star to a 415 V, three-phase, 50 Hz supply. (a) Calculate the total power taken by the load. (b) Also calculate the power consumed in the resistors if they are connected in delta to the same supply. (c) if one of the resistors is open circuited in each case, calculate the power consumed. [6]

Question No. 6

The following results were obtained on a 50 kVA, 2400/120 V transformer: [8]

Open-circuit test, instrument on l.v. side

Wattmeter reading = 396 W, Ammeter reading = 9.65 A, Voltmeter reading = 120 V

Short-circuit test, instrument on h.v. side

Wattmeter reading = 810 W, Ammeter reading = 20.8 A, Voltmeter reading = 92 V

Determine:

a) the circuit constants;
b) the efficiency at full load, 0.8 power factor lagging;
c) the approximate voltage regulation

Question No. 7 [2]

a) Describe the following in case of measuring instruments:
   1) Deflecting Torque
   2) Controlling Torque
   3) Damping Torque

b) Describe the construction and working of electrodynamic type wattmeter. Write the various features and advantages of electrodynamic wattemeter. [6]

OR

Describe with diagrams the construction and principle of operation of the permanent magnet moving-coil instrument. Discuss the advantages, limitations and application of PMMC instruments. [8]

Question No. 8

A choke coil is connected in series with a 20 μF capacitor. With a constant supply voltage of 200 V the circuit takes its maximum current of 50 A when the supply frequency is 50 Hz. Calculate (a) resistance and inductance of the choke coil; (b) the voltage across capacitor. [6]

Question No. 9

A three-phase load consists of three similar inductive coils, each of resistance 50 ohm and inductance of 0.3 H. The supply is 415 V, 50 Hz. Calculate: (a) the line current; (b) the power factor; and (c) the total power when the load is (i) star connected and (ii) delta connected. [8]

OR

The three arms of a three phase load each comprise of an inductor of resistance 25 ohm and of inductance 0.15 H in series with a 120 μF capacitor. The supply is 415 V, 50 Hz. Calculate the line current and the total power in watts, when the three arms are connected (a) in star; (b) in mesh.