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MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL
(A Constituent Institute of Manipal University, Manipal)

SECOND SEMESTER B.E. DEGREE MAKEUP EXAMINATION
(REVISED CREDIT SYSTEM)

07 JULY 2010

BASIC ELECTRICAL TECHNOLOGY (ELE 101/102)

Time: 3 hours **Max. Marks: 50**

Note : Answer any **FIVE** full questions.
Missing data, if any, may be suitably assumed.

1A. For the circuit shown in Fig. Q1A, use Mesh Current analysis and determine
(i) current through 4.5 Ω resistance and (ii) voltage across the terminals A and B. (05)

1B. Two coupled inductors have an effective inductance of 30 mH when connected in series addition and 10 mH when connected in series opposition. Given the coupling co-efficient as 0.8, determine the self inductances of the two coils and mutual inductance between them. (05)

2A. For the circuit shown in Fig. Q2A,
(i) Rewrite the network by converting voltage sources to current sources wherever possible.
(ii) Using Node voltage method, determine the power dissipated in 6 Ω resistance. (05)

2B. A 10 V battery is switched on to a series RL circuit at time t = 0. The circuit components are 50 Ω and 10 mH. Calculate the circuit current and voltage across inductor at 0.15 milli second after switching. (02)

2C. A magnetic circuit is made of a circular iron ring of mean circumference of 85 cm. A saw cut across its cross section is made which is equivalent to an air gap of 1 mm. A coil of 1000 turns wound on the ring carries a current of 0.6 A resulting in a magnetic flux of 1.5 mWb in the air gap. If the relative permeability of iron is 400 and leakage factor is 1.2, calculate the cross sectional area of iron ring. Neglect fringing effect. (03)

3A. A 200 V, 50 Hz single phase supply is given to a series circuit comprising of a resistance of 50 Ω and an inductive coil having an internal resistance 'r' and inductance 'L'. The current through the circuit is 1.5 A which consumes a power of 135 Watts. Calculate
(i) Values of 'r' and 'L', (ii) Voltage across the coil. (05)

3B. For the network shown in Fig. Q3B, obtain the equivalent impedance across the terminals A and B. (02)

3C. With reference to Fig. Q3C, calculate value of inductance so that the circuit resonates at supply frequency. (03)

4A. A 3 phase, RYB sequence, 400V supply is connected to unbalanced delta load. The load impedances are $Z_{RY} = 10\angle 70^0\ \Omega$ $Z_{YB} = 15\angle 30^0\ \Omega$ $Z_{BR} = 20\angle -45^0\ \Omega$ With V_{RY} as reference, determine the three line currents. (06)

4B. A 3 phase, 230 V supply is given to a balanced star connected load of 15 – j 50 Ω per phase. Calculate the line current drawn from the supply. If two wattmeters are used to measure total power, compute wattmeter readings. Verify the power factor angle with the aid of wattmeter readings. (04)

5A. The approximate equivalent circuit with respect to primary side of a single phase transformer is shown in Fig. Q5A. Determine
(i) Primary current drawn from the supply
(ii) Iron and copper loss
(iii) % voltage regulation. (06)

5B. With a neat sketch, explain the operating principle of the Permanent Magnetic Moving Coil instrument. (04)

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6A. Explain the constructional details of squirrel cage and slip ring types of rotors used in three phase induction motors. (04)

6B. A 3 phase, 4 pole, 50 Hz induction motor has rotor resistance of 1.2 Ω per phase and rotor standstill reactance of 5 Ω per phase. The induced emf between rotor slip rings on open circuit is 80 Volts. Calculate the electromagnetic torque developed at (i) starting (ii) When running at a speed of 1440 rpm. (03)

6C. Write technical notes on Stepper Motor. (03)

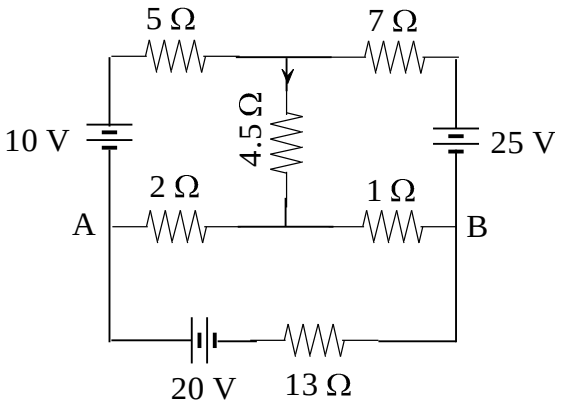

Fig. Q 1A

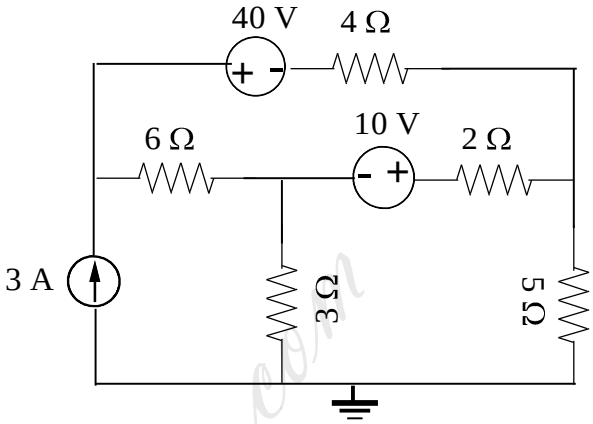

Fig. Q 2A

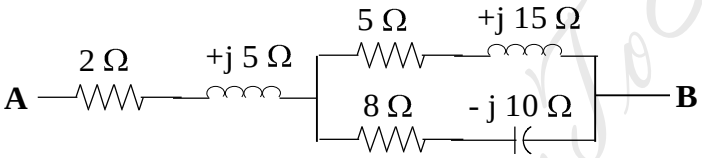

Fig. Q 3B

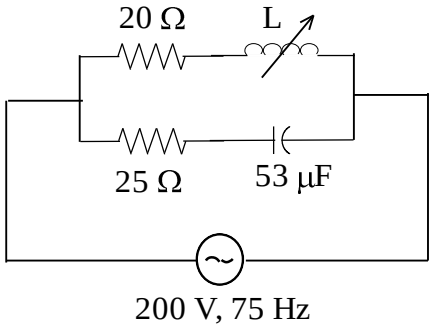

Fig. Q 3C

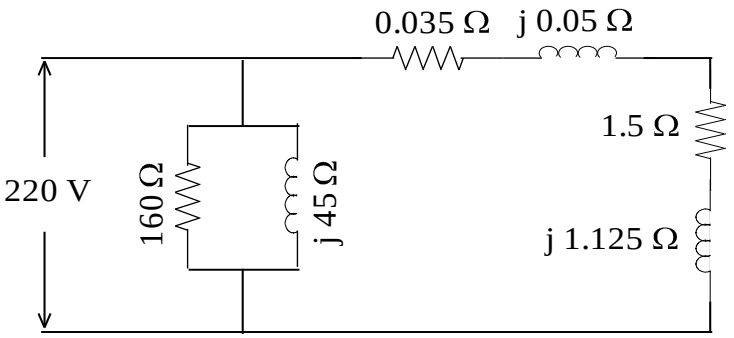

Fig. Q 5A

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