CBCS SCHEME

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15ELE15/25

First/Second Semester B.E. Degree Examination, July/August 2022
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing one full question from each module.***

Module-1

1 a. State and explain Kirchoff's laws, with suitable examples. **(05 Marks)**

b. A coil of 500 turns wound on a core of non–magnetic material ($\mu_r = 1$), has an inductance of 9 mH. Calculate : i) the flux produced by a current of 10 A and ii) the average value of the e.m.f induced, when the current is reversed in 10 milli seconds. **(05 Marks)**

c. In the circuit shown in Fig. Q1(c), determine : i) the current supplied by the source and ii) voltage across 6 Ω resistor. **(06 Marks)**

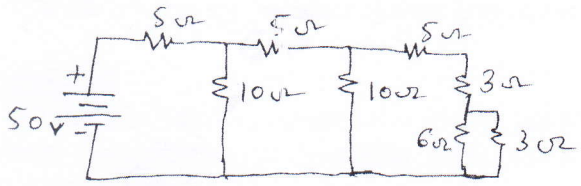

Fig. Q1(c)

OR

2 a. Define co-efficient of coupling and find its relation with L_1, L_2 and M. **(05 Marks)**

b. Two 2000 turns, air cored coils, 200 cm long having a cross sectional area of 8 cm^2, are placed side by side. The mutual inductance between them is 0.5 mH. Find L_1, L_2 and K. **(05 Marks)**

c. The total power consumed by the network shown in Fig. Q2(c) is 16 watts. Find the value of R and the total current. **(06 Marks)**

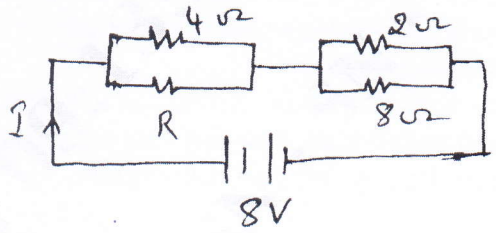

Fig. Q2(c)

Module-2

3 a. Derive an expression for the torque developed in a DC motor. **(05 Marks)**

b. With a neat diagram, explain working principle and operation of a single phase dynamo – meter type wattmeter. **(05 Marks)**

c. A 6 pole DC generator has 498 armature conductors. The average e.m.f generated in each conductor for a given flux and speed is 2 volts. The current in each conductor is 120 Amps. Find the total current and generated e.m.f of the armature if the winding is connected as i) Lap and ii) Wave. Also find the total power generated in each case. **(06 Marks)**

OR

4 a. Draw and explain characteristics of series and shunt motors. **(05 Marks)**

b. With neat diagram, explain the working principle of an induction type single phase energy meter. **(05 Marks)**

c. The armature of a 6 pole DC motor has wave winding with 87 slots, each slot containing 6 conductors. The flux/pole is 20 mwb and the armature resistance is 0.13Ω. Calculate the speed when the motor is connected to a 240 volt supply. It takes an armature current of 80 A. Calculate also the torque developed by the armature. **(06 Marks)**

Module-3

5 a. Derive an expression for power consumed by R L circuit excited from a sinusoidal AC voltage. **(05 Marks)**

b. A voltage of (100 + j50)V is applied to a circuit. The current is (50 − j40) A. Find the impedance the circuit elements, the power factor and power taken when the frequency is 50 Hz. **(06 Marks)**

c. With a neat diagram, explain the plate earthing. **(05 Marks)**

OR

6 a. Define the following : active power, Reactive power, apparent power and power factor in an AC circuit. **(05 Marks)**

b. Explain the concealed conduit type of wiring. **(05 Marks)**

c. Two circuits connected in parallel have ; i) a coil of resistance 20Ω and inductance 0.07 H and ii) a capacitance of 60 μF in series with a resistance of 50 Ω. Calculate the current in the mains and power factor when connected across 200 V, 50 Hz supply. **(06 Marks)**

Module-4

7 a. What are the advantages of three systems? **(04 Marks)**

b. When three balanced impedances are connected in star, across a 3–phase, 415V, 50Hz supply, the line current drawn is 20A, at a lagging p.f. of 0.4. Determine the parameters of the impedance in each phase. **(06 Marks)**

c. A 6 pole, 3–phase, star connected alternator has an armature with 90 slots and 12 conductors per slot. It revolves at 1000 rpm, the flux per pole being 0.5 wb. Calculate the e.m.f generated, if the winding factor is 0.97 the coil is full pitched. **(06 Marks)**

OR

8 a. Explain the constructional features of alternator. **(05 Marks)**

b. Obtain the relationship between line voltage and phase voltages in a balanced 3–phase star connected system. **(05 Marks)**

c. Two watt-meters are connected to measure the input of a 15 H.P, 50Hz, 3–phase induction motor at full load. The full load efficiency and p.f. are 0.9 and 0.8 lagging respectively. Find the readings of the two watt-meters. **(06 Marks)**

Module-5

9 a. List out the various losses in a transformer and explain how they vary with load and how they are minimized. **(05 Marks)**

b. Compare the squirrel cage type with slip ring induction motor and mention their applications. **(05 Marks)**

c. A 10 KVA transformer has a maximum efficiency at 3/4 of full load and unity p.f. The copper loss at this load and p.f. is 314W. Compute the efficiency of the transformer at 50% and 100% rated full load at the same p.f. **(06 Marks)**

OR

10 a. Derive an equation for e.m.f induced in a transformer. **(05 Marks)**

b. Explain the working principle of 3–phase induction motor. **(05 Marks)**

c. A 6 pole alternator runs at 1000 rpm., and supplies power to a 4 pole, 3 phase induction motor. The frequency of rotor of induction motor is 2 Hz. Determine the slip and speed of the motor. Also determine the slip at no load of the induction motor, if the difference between the synchronous speed and no load speed is 10 rpm. **(06 Marks)**

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