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14ELE15/25

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, selecting ONE full question from each module.***

Module-1

1 a. State and explain the following terms:
(i) Independent Voltage Source
(ii) Electro Motive Force (EMF)
(iii) Kirchoff's Voltage Law (KVL) **(06 Marks)**

b. If the total power dissipated in the circuit shown in Fig.Q1(b) is 18 Watts, find the value of 'R' and its current.

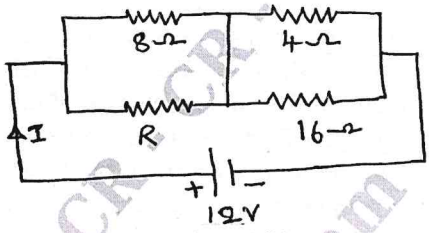

Fig.Q1(b) **(06 Marks)**

c. A coil of 2000 turns is wound uniformly over a non magnetic ring of mean circumference of 80 cm and cross sectional area of 0.6 sq.cm. If the current through the coil is 2A, calculate:
(i) Magnetizing force (ii) Reluctance (iii) Total flux (iv) Flux density **(08 Marks)**

2 a. Give the analogy between Electric and Magnetic circuits. **(06 Marks)**

b. Find the value of resistance 'R' as shown in Fig.Q2(b), so that current drawn from the source is 250 mA. All the resistor values are in ohm.

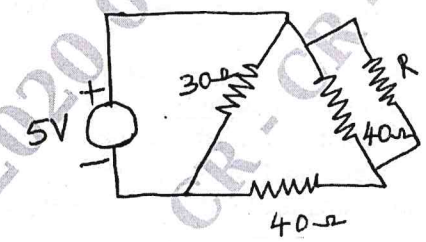

Fig.Q2(b) **(06 Marks)**

c. Two identical coils of 1200 turns each, are placed side by side such that, 60% of the flux produced by one coil links the other. A current of 10A in the first coil, sets up a flux of 0.12 mwb. If the current in the first coil changes from +10A to −10A in 20 m sec, find:
(i) the self inductance of the coils (ii) the emfs induced in both the coils. **(08 Marks)**

Module-2

3 a. With usual notations derive the e.m.f equation of a d.c. generator. **(06 Marks)**

b. With a neat schematic diagram, explain the constructional features and operation of an induction type single phase energy meter. **(06 Marks)**

c. A dc series generator has armature resistance of 0.5 Ω and series field resistance of 0.03 Ω. It drives a load of 50 A. If it has 6 turns/coil and total 540 coils on the armature and is driven at 1500 rpm, calculate the terminal voltage at the load. Assume 4 poles, lap type winding, flux per pole as 2 mwb and total brush drop as 2V. **(08 Marks)**

4 a. What is back EMF in a dc motor? Explain its significance. **(06 Marks)**

b. With neat schematic diagram, explain the construction and working principle of dynamo meter type wattmeter. **(06 Marks)**

c. A 440 V dc shunt motor takes an armature current of 20 A and runs at 500 rpm. The armature resistance is 0.6 ohms. If the flux is reduced by 30% and the torque is increased by 40%. Calculate the new values of armature current and speed. **(08 Marks)**

Module-3

5 a. Obtain an expression for the current in the pure inductor if the voltage $v = v_m \sin \omega t$ is applied across. **(06 Marks)**

b. Write notes on: (i) Electric Fuse (ii) Electric shock **(06 Marks)**

c. An e.m.f. whose instaneous value is $100\sin\left(314t - \frac{\pi}{4}\right)$ Volts is applied to a circuit and the current flowing through it is $20\sin(314t - 1.5708)$ Amperes. Find the frequency and the values of circuit elements, assuming a series combination of circuit elements. **(08 Marks)**

6 a. With circuit connections, explain two way control of lamp. **(06 Marks)**

b. Deduce a condition at which an RLC circuit behaves like a resistive circuit. State whether the current in the circuit is minimum or maximum. **(06 Marks)**

c. Am alternating voltage of (160 + j120) Volts is applied to a circuit and the current is given by (6 + j8)A. Find the values of element of the circuit assuming 50 Hz frequency, power factor of the circuit and power consumed. **(08 Marks)**

Module-4

7 a. Discuss the advantages of three phase system. **(06 Marks)**

b. Obtain the relationship between line and phase values of current in a three phase balanced star connected system. **(06 Marks)**

c. Power is measured in a three phase balanced load using two wattmeters. The line voltage is 400 V. The load and its power factor is so adjusted that the line current is always 10A. Find the reading of the wattmeters when the power factor is
(i) unity (ii) 0.866 (iii) 0.5 (iv) zero. **(08 Marks)**

8 a. Distinguish between salient and non-salient type of alternator rotors. **(06 Marks)**

b. Derive an e.m.f. equation of an alternator. **(06 Marks)**

c. A 3-phase, 6-pole, star-connected alternator revolves at 1000 rpm. The stator has 90 slots and 8 conductors per slot. The flux per pole is 0.05 wb (sinusoidally distributed). Calculate the voltage generated by the machine if the winding factor is 0.96 line and phase value. **(08 Marks)**

Module-5

9 a. Mention the types of transformers. With neat schematic diagram, explain the construction and working shell type transformer. **(06 Marks)**

b. Explain the various losses in a transformer and how to minimize them. On what factors they depend? Give the equations for these losses. **(06 Marks)**

c. A 600 KVA transformer has an efficiency of 92% at full load, unity power factor and at half load, 0.9 power factor. Determine its efficiency at 75% of full load and 0.9 power factor. **(08 Marks)**

10 a. Explain the working principle of three phase induction motor. **(06 Marks)**

b. If a six pole induction motor supplied from a three phase 50 Hz supply has a rotor frequency of 2.3 Hz. Calculate: (i) The percentage slip (ii) The speed of the motor. **(06 Marks)**

c. With a neat circuit diagram, explain a star-delta starter for a three phase induction motor. **(08 Marks)**

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