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14ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2019
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

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

Module – 1

1 a. For the figure Q1 (a), calculate the value of 'R' and applied voltage V. **(08 Marks)**

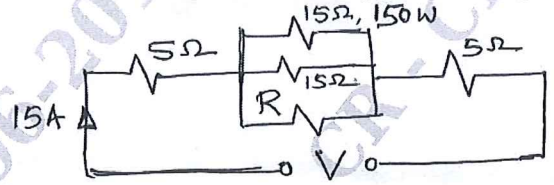

Fig. Q1 (a)

b. With examples clearly differentiate between statically induced emf and dynamically induced emf. **(06 Marks)**

c. Define coefficient of coupling and establish a relation between self inductance, mutual inductance with the coefficient of coupling. **(06 Marks)**

2 a. A battery of 40 V and internal resistance of 2 Ω is connected in parallel with a second battery of 44 V and internal resistance of 4 Ω. A load resistance of 6 Ω is connected across the ends of the parallel circuit. Calculate the current in each battery and in the load. **(08 Marks)**

b. Compare electric circuit and magnetic circuit. **(06 Marks)**

c. State Faraday's laws of electromagnetic induction and Lenz's laws. **(06 Marks)**

Module – 2

3 a. Derive an expression for Armature torque in DC motor. **(06 Marks)**

b. An 8 pole dc generator has 500 conductors on its armature, and is designed to have 0.02 wb of magnetic flux per pole crossing the air gap with normal excitation (A) What voltage will be generated at a speed of 1800 rpm, if the armature is (i) wave wound (ii) lap wound? (B) If the allowable current is 5 A per path, what will be the power generated by the machine in each case? **(08 Marks)**

c. Explain the construction and working of Dynamometer type wattmeter. Draw the circuit diagram. **(06 Marks)**

4 a. Derive the emf equation of DC Generator. **(06 Marks)**

b. A 230 V DC shunt motor takes a no load current of 3A and runs at 1100 rpm. If the full load current is 41 A. Find the speed on full load. Assume armature resistance 0.25 Ω and shunt field resistance 230 Ω. **(08 Marks)**

c. With a neat sketch, explain the working of single phase induction type energy meter. **(06 Marks)**

Module – 3

5 a. Show that, the power consumed in a pure inductance is zero and derive the expression for current, with voltage sinusoidally varying. **(06 Marks)**

5 b. When 220 V AC supply is applied across AB terminals for the circuit shown in Fig. Q5 (b), the power input is 3.25 kW and the current is 20 A. Find the current through Z_3. **(08 Marks)**

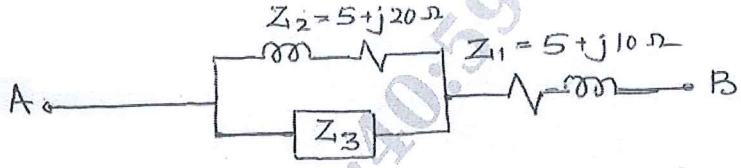

Fig. Q5 (b)

c. With a neat sketch, explain the construction and working of residual current circuit Breaker. **(06 Marks)**

6 a. A resistance R in series with a capacitor C is connected to 50 Hz, 240 V supply. Find the value of C so that R absorbs 300 W at 100 V. Find also the maximum charge and maximum energy stored in C. **(08 Marks)**

b. Derive expressions for calculating the impedance of a series RL circuit. Draw voltage triangle. Also draw the phasor diagram and explain. **(06 Marks)**

c. What is the necessity of earthings? Explain with neat sketch the pipe earthing. **(06 Marks)**

Module – 4

7 a. What are the advantages of three phase voltage system over single phase voltage system? **(04 Marks)**

b. Three, 50 Ω resistors are connected in star across 3-phase 400 V supply.
(i) Find phase current, line current and power taken from ac supply.
(ii) What would be the above values if the resistors were delta connected? **(08 Marks)**

c. With neat diagrams, explain the constructional features of a 3-phase alternator. **(08 Marks)**

8 a. With the relevant vector diagram, show that only two wattmeters are sufficient to measure three phase power for balance lagging p.f. load. **(08 Marks)**

b. List the advantages of having stationary armature and rotating field system in large size alternators. **(06 Marks)**

c. A 3-phase, 16-pole star connected alternator has 144 slots on the armature periphery. Each slots consists of 10 conductors. It is driven at 375 rpm. The line value of emf available across the terminals is 2667 V. Find the frequency of the induced emf and flux per pole. Assume $K_p = 1$ and $K_d = 0.96$. **(06 Marks)**

Module – 5

9 a. Explain various losses in transformers. How these losses can be minimized? **(06 Marks)**

b. A 600 KVA transformer has an efficiency of 92% both at half load uPF and full load 0.9 p.f. Calculate its efficiency at 75% of full load and 0.8 p.f. **(08 Marks)**

c. Explain the principle of operation of a 3-phase induction motor and give reason for why an induction motor cannot run at synchronous speed? **(06 Marks)**

10 a. Derive the emf equation of a transformer and explain types of transformers. **(06 Marks)**

b. The rotor induced voltage of a three phase, 4-pole squirrel cage induction motor fed by a salient pole alternator is observed to make 1.5 alterations per second. The star connected alternator with 592, full pitched armature conductors in series per phase with $K_d = 0.966$ develops a line voltage of 6600 V when the flux per pole is 60 mwb. Determine the speed of the induction motor. **(08 Marks)**

c. Explain, why an induction motor draws high current during starting? **(06 Marks)**

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