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2002 SCHEME ELE15/25

First/Second Semester B.E. Degree Examination, June-July 2009
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. State Faraday's laws of electromagnetic induction. Distinguish between statically induced emf and dynamically induced emf with example. **(06 Marks)**

b. Derive an expression for the energy stored in the magnetic field. **(06 Marks)**

c. A coil of 1000 turns is wound on a torroidal magnetic core having a reluctance of 10^6AT/wb. When the coil current is 5 A and is increasing at the rate of 200 A/S, determine
i) Energy stored in the magnetic field.
ii) Voltage applied across the coil, assume coil resistance as zero.
iii) How are your answers affected if the coil resistance is 2 Ω (ohms). **(08 Marks)**

2 a. Explain the following terms:
i) RMS value
ii) Average value
iii) Form factor **(06 Marks)**

b. Derive an expression for the instantaneous power in a pure capacitor energized by a sinusoidal voltage. Draw the wave shapes of voltage, current and power signals involved. **(08 Marks)**

c. A choke coil takes a current of 2A lagging 60° behind the applied voltage of 200V at 50 Hz. Calculate the inductance, resistance and impedance of the coil. Also determine the power consumed when it is connected across 100V, 25 Hz supply. **(06 Marks)**

3 a. What is the relation between (i) phase voltage and line voltage (ii) Phase current and line current, in star and delta systems? Derive these relations. **(06 Marks)**

b. Show that power in a 3-phase circuit can be measured using 2 watt meters. Draw the circuit diagram and vector diagram. **(08 Marks)**

c. Three impedances, each consisting of 20 Ω resistance and 50 Ω inductive reactance in series, are connected in delta across 3-phase, 400V, 50Hz balanced supply. Calculate
i) Phase and line currents ii) Total power consumed iii) Power factor of the load. **(06 Marks)**

4 a. With the help of a neat diagram, explain the principle of operation of dynameter type wattmeter. **(10 Marks)**

b. Mention different types of wiring. With relevant circuit diagrams and switching tables explain two-way and three-way control of lamps. **(10 Marks)**

5 a. Draw a neat sketch representing the cut-section view of a DC machine. Explain important features of different parts in DC machine. **(06 Marks)**

b. Explain why starter is needed for starting the D.C. Motor? With a neat figure explain working of three-point starter. **(08 Marks)**

c. A D.C. shunt motor runs at 750 rpm from 250V supply and is taking a full load line current of 60A. Its armature resistance is 0.4 Ω and field resistance of 125 Ω. Assuming 2 V brush drop and negligible armature reaction effect find the no load speed for a no load current of 6 amperes. **(06 Marks)**

6 a. Explain the principle of operation of a single phase transformer and derive its EMF equation. **(08 Marks)**

b. Define regulation of a transformer. Derive an expression the regulation of a transformer at lagging power factor. **(04 Marks)**

c. In a 25 kVA, 2000/200 V single phase transformer the iron and full load copper losses are 350W and 400W respectively. Calculate the efficiency at unity P.f. (i) Full load and (ii) Half full load. **(08 Marks)**

7 a. Discuss the main constructional features of cylindrical rotor and salient pole alternators. When is the cylindrical rotor construction preferred and why? **(08 Marks)**

b. Derive an expression for the emf induced in an alternator. **(06 Marks)**

c. Calculate the induced emf in a 3-phase, 8.pole star connected alternator running at 750 rpm having the following data:

Sinusoidally distributed flux per pole= 55 MWb
Total number of slots on the armature = 72
Number of conductors per slot = 10
Winding factor = 0.96 **(06 Marks)**

8 a. Explain the construction of squirrel cage and phase wound induction motors. Mention their applications. **(08 Marks)**

b. Explain the working of Star-Delta starter used for starting a 3-phase induction motor. **(06 Marks)**

c. Write a note on slip. A 3-phase, 6-pole, 60 Hz induction motor has a slip of 3% at full load. Find the synchronous speed, the full load speed and the frequency of the rotor current at full load. **(06 Marks)**

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