2002 SCHEME

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ELE15/25

First / Second Semester B.E. Degree Examination, December 2010
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Show that the energy stored in a magnetic field is given by, $\frac{LI^2}{2}$, with usual notations. **(05 Marks)**

b. Two identical coils of 1200 turns each one placed side by side, such that 60% flux produced by one coil links the other. A current of 10 A 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 msec, find
i) The self inductance of the coils
ii) The emf induced in both coils. **(07 Marks)**

c. Derive expressions for the rms and average value and the form factor for sinusoidally varying A.C. voltage. **(08 Marks)**

2 a. Show that the average power in an A.C. circuit is given by VI cosϕ. **(05 Marks)**

b. A series RL circuit takes 384 watts at a power factor of 0.8 from a 120 V, 60 Hz supply. What are the values of R & L? **(05 Marks)**

c. An inductive coil of resistance 7Ω and inductance of 0.0125 H is connected in parallel with R-C series circuit of resistance 8Ω and capacitance of 1000 μF. If the voltage across the parallel combination is 200 V, find
i) Current in each branch,
ii) Total current
iii) Power taken from the supply. **(10 Marks)**

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

b. Show that in a three phase, balanced circuit, two wattmeters are sufficient to measure the total three phase power. **(08 Marks)**

c. A balanced 3 phase, star connected load of 150 kW takes a leading current of 100 A with a line voltage of 1100 V, 50 Hz. Find the circuit constants of load per phase. **(08 Marks)**

4 a. With a neat diagram, explain the construction and working of a dynamometer type wattmeter. **(08 Marks)**

b. With relevant circuit diagrams and switching tables, explain two way and three way control of lamps. **(07 Marks)**

c. With a neat sketch, explain the pipe earthing method. **(05 Marks)**

5 a. Draw the cross sectional view of a d.c. machine and explain the functions of each part. **(08 Marks)**

b. Derive the emf equation of a d.c. generator from fundamentals. **(06 Marks)**

c. A 500 V, shunt motor has 4 poles and a wave connected winding with 492 conductors. The flux per pole is 0.05 wb. The full load current is 20 A. The armature and shunt field resistances are 0.1 Ω and 250 Ω respectively. Calculate the speed and torque developed. **(06 Marks)**

6 a. What is the necessity of a starter for a d.c. motor? With a neat sketch, explain the working of three point starter. **(08 Marks)**

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

c. A 3 phase, 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux/pole is 0.03 wb and the speed is 375 rpm. Find the frequency, the phase and line emf. Take pitch factor $K_p = 1$ and distribution factor $K_d = 0.96$. **(06 Marks)**

7 a. Derive the emf equation of a single phase transformer. **(06 Marks)**

b. Develop an expression for the efficiency of a single phase transformer and obtain the condition for maximum efficiency. **(06 Marks)**

c. A 600 KVA, single phase transformer has an efficiency of 92% both at full and half full load, unity power factor. Determine the efficiency at 75% full load at 0.9 p.f. lag. **(08 Marks)**

8 a. Explain the principle of operation of a 3 phase induction motor. **(05 Marks)**

b. A three phase induction motor has 6 poles and runs at 960 rpm on full load. It is supplied by an alternator having 6 poles and running at 1000 rpm. Calculate the full load slip and the frequency of rotor currents of the induction motor. **(07 Marks)**

c. Explain the necessity of starter for an induction motor. With a neat circuit diagram, explain a star-delta starter for a 3 phase induction motor. **(08 Marks)**

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