CBCS SCHEME

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15ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
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 Kirchoff's laws applied to an electric circuit. **(05 Marks)**

b. Explain the meaning of,
(i) Self-induced voltage.
(ii) Mutually induced voltage and give a practical example of each effect. **(05 Marks)**

c. In the resistance circuit of Fig. Q1 (c), find V_1 and I_2.

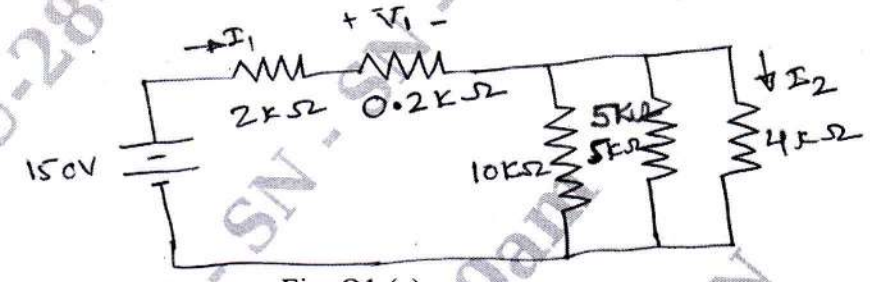

Fig. Q1 (c) **(06 Marks)**

OR

2 a. Deduce an expression for stored energy in a magnetic field. **(05 Marks)**

b. A direct current circuit comprises two resistors, 'A' at value 25 Ω and 'B' of unknown value, connected in parallel together with third resistor 'C' of value 5 Ω connected in series with parallel group. The potential difference across C is found to 90 V. If the total power in the circuit is 4320 W, Calculate :
(i) The value of resistor 'B'.
(ii) The voltage applied to the ends of whole circuit.
(iii) The current in each resistor. **(05 Marks)**

c. Two coils 'A' of 12,500 turns and 'B' of 16000 turns, lie in parallel planes so that 60% of flux produced in A links coil B. It is found that a current of 5A in A produces a flux of 0.6 mwb while the same current in B produces 0.8 mwb. Determine
(i) Mutual inductance and (ii) Coupling co-efficient. **(06 Marks)**

Module-2

3 a. Draw a neat sketch of a d.c. generator. State the functions of main parts. **(06 Marks)**

b. Explain with neat sketch, the construction and working of dynamometer type wattmeter. **(06 Marks)**

c. A 4-pole generator with wave wound armature has 51 slots each having 48 conductors, the flux per pole is 7.5 mwb. At what speed must the armature be driven to give an induced emf of 440 V. **(04 Marks)**

OR

4 a. Derive the torque equation of a D.C. motor. **(05 Marks)**

b. With neat diagram, explain the construction and working of single phase induction type energy motor. **(06 Marks)**

c. Explain the characteristics of series motor. **(05 Marks)**

Module-3

5 a. Explain the following terms applied to alternating current wave :

(i) Maximum value.

(ii) Average value.

(iii) r.m.s value **(05 Marks)**

b. Write a note on :

(i) Precaution against electric shock.

(ii) Three way control of lamp. **(06 Marks)**

c. A 230 V, 50 Hz a.c. supply is applied to a coil of 0.06 H inductance and 2.5 Ω resistance connected in series with a 6.8 μF capacitor. Calculate :

(i) Impedance

(ii) Current

(iii) P.f.

(iv) Power consumed. **(05 Marks)**

OR

6 a. Define and express interms of voltage, current and phase angle :

(i) Abparent power

(ii) Active power

(iii) Reactive power **(04 Marks)**

b. Explain with neat sketch pipe earthing. **(06 Marks)**

c. A 60 Ω resistor connected in parallel with an inductive reactance of 80 Ω to a 240 V, 50 Hz supply. Calculate

(i) The current through the resistor and inductive reactance.

(ii) Supply current.

(iii) The circuit phase angle. **(06 Marks)**

Module-4

7 a. Establish the relation between phase and line values (V & I) of 3-phase Y connected system. Draw relevant vector diagram. **(06 Marks)**

b. List the advantages of rotating field type alternator. **(04 Marks)**

c. Two wattmeters are used to measure power in a 3-phase balanced load. The wattmeter readings are 8.2 kW and 7.5 kW. Calculate

(i) Total active power (ii) p.f. (iii) Total reactive power

(iv) Total apparent power **(06 Marks)**

OR

8 a. Show that two wattmeters are sufficient to measure three phase power. **(05 Marks)**

b. 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. Calculate the voltage generated by the machine if the winding factor is 0.96. **(06 Marks)**

c. A delta connected load draws a current of 15 A at a lagging power factor of 0.85 from a 400 V, 3-phase, 50 Hz supply. Find the resistance and inductance of each phase. **(05 Marks)**

Module-5

9 a. Describe the operation of a single-phase transformer, explaining clearly the functions of the main parts. **(06 Marks)**

b. Derive the equation relating rotor frequency and stator frequency of a 3-phase induction motor. **(05 Marks)**

c. A 125 KVA transformer having primary voltage of 2000 V at 50 Hz has 182 primary and 40 secondary turns. Neglecting losses, calculate (i) The full load primary and secondary currents (ii) The no load secondary induced emf and (iii) The maximum flux in the core. **(05 Marks)**

OR

10 a. Explain the principle of operation of 3-phase induction motor. Show flow rotating magnetic field is established in air gap and rotates at synchronous speed. **(06 Marks)**

b. Write a note on losses occurred in the single phase transformer. **(05 Marks)**

c. A single phase transformer working at unity power factor has an efficiency of 90% at both half load and at the full load of 500 W. Determine the efficiency at 75% full load and the maximum efficiency. **(05 Marks)**

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