CBCS SCHEME

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17ELE15/25

First/Second Semester B.E. Degree Examination, Feb./Mar. 2022

Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. State and explain Kirchhoff's Laws as applied to D.C circuits. **(06 Marks)**

b. Define the co-efficient of coupling and find its relation with L_1, L_2 and M. **(06 Marks)**

c. In the circuit shown in Fig Q1(c), what is the voltage across AB if (i) Switch S in open and (ii) Switch S is closed.

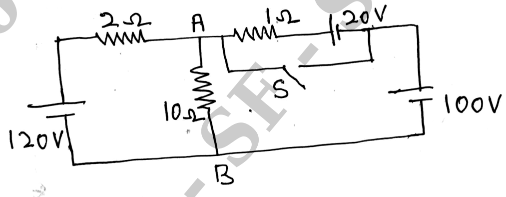

Fig Q1(c) **(08 Marks)**

OR

2 a. State and explain Faraday's Laws of Electro-magnetic inductions. **(06 Marks)**

b. Derive an expression for the energy stored in an inductive coil. **(06 Marks)**

c. A circuit consists of two parallel resistors having resistances of 20Ω and 30Ω respectively connected in series with 15Ω. If the current through 15Ω resistor is 3A, find : i) Current in 20Ω and 30Ω resistor ii) The voltage across the whole circuit iii) The total power and power consumed in all resistances. **(08 Marks)**

Module-2

3 a. Define back emf of D.C motor. What is its significance? **(04 Marks)**

b. With a neat sketch, explain the construction of the various parts of a D.C generator. **(08 Marks)**

c. With a neat figure, explain the construction and working principle of a dynamometer type Wattmeters. **(08 Marks)**

OR

4 a. Deriver the Torque equations of a D.C motor. **(06 Marks)**

b. Sketch the various characteristics of D.C shunt and D.C series motor. **(06 Marks)**

c. A 4 pole 220V, lap connected D.C shunt motor has 36 slots, each slot containing 16 conductors; it draws a current of 40A from the supply. The field resistance and armature resistances are 110Ω and 0.1Ω respectively. The motor develops an output power of 6kW. The flux per pole is 40mwb. Calculate: i) The speed ii) The Torque developed by armature and iii) The shaft torque. **(08 Marks)**

Module-3

5 a. Define and derive an expression for root mean square value of an alternating quantity. **(06 Marks)**

b. Derive an equation for the power consumed by an R-L series circuit. Draw the waveform of voltage, current and power and draw the phasor diagram, **(08 Marks)**

c. With a neat figure, explain pipe earthing. **(06 Marks)**

OR

6 a. With a circuit diagram, explain the working of a two way control of a Lamp. **(06 Marks)**

b. A circuit consists of a resistance of a 10Ω, an inductance of 16mH and a capacitance of 150μF connected in series. A supply of 100V at 50Hz is given to the circuit. Find the current, p.f and power consumed by the circuit. Draw the vector diagram. **(06 Marks)**

c. Two circuits A and B connected in parallel across 200V, 50Hz supply circuit. A consists of 10Ω resistance of 0.12H inductance in series while circuit B consists of 20Ω resistance in series with 40μF capacitance. Calculate i) current in each branch ii) Supply current iii) Total power factor. Draw the phasor diagrams. **(08 Marks)**

Module-4

7 a. Derive the emf equation of A.C generator. **(06 Marks)**

b. Show that the two Wattmeters are sufficient to measure three phase power. Also derive an expression for the power factor in terms of wattmeter readings. **(08 Marks)**

c. When three balanced impedance are connected in star across a 3 phase 415V, 50Hz supply. The line current drawn is 20A, at a Lagging p.f of 0.4. Determine the parameters of the impedance in each phase. **(06 Marks)**

OR

8 a. In a three phase Delta connection, find the relation between line and phase values of current and voltages. Also derive the equation for three phase power. **(06 Marks)**

b. With neat sketches, explain the construction of salient pole alternator. **(06 Marks)**

c. A 24 pole turbo alternator has star connected armature winding with 144 slots and 10 conductors per slot, it is driven by a low speed Kaplan turbine at a speed of 250 rpm. The winding has full pitched coils with a distribution factor of 0.966. The flux per pole is 67.3mwb. Determine: i) The frequency and magnitude of line voltage ii) The output KVA of the machine, if the total current in each phase is 50A. **(08 Marks)**

Module-5

9 a. Derive EMF equation of transformer. **(06 Marks)**

b. Derive the condition for which the efficiency of a transformer is maximum. **(06 Marks)**

c. A 3 phase, 6 pole, 50Hz Induction motor has a slip of 1% at no-load, and 3% at full load. Determine : i) Synchrous speed ii) no-load speed iii) Full load speed iv) Frequency of rotor current at stand still v) Frequency of rotor current at full load. **(08 Marks)**

OR

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

b. A single phase 20KVA transformer has 1000 primary turns and 2500 secondary turns. The net cross sectional area of the core is 100cm^2. When the primary winding is connected to 500V 50Hz supply, calculate: i) The maximum flux density in the core ii) The voltage induced in the secondary winding iii) The primary and secondary full load currents. **(06 Marks)**

c. A single phase transformer working at 0.8p.f has an efficiency of 94% at both three fourth full load of 600kW. Determine the efficiency at half full load, unity power factor. **(08 Marks)**

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