CBCS SCHEME

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21ELE13/23

First/Second Semester B.E. Degree Examination, June/July 2023
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 Kirchoff's current and Voltage law. **(06 Marks)**

b. Determine the current in all branches of the network shown in Fig. Q1(b). **(07 Marks)**

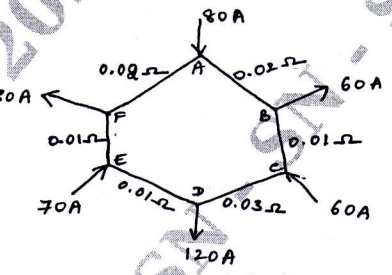

Fig. Q1(b)

c. Define RMS value of an alternating current and derive an expression for it. **(07 Marks)**

OR

2 a. State and explain maximum power transfer theorem. **(06 Marks)**

b. If the total power dissipated in the circuit shown below in Fig. Q2(b) is 18W. Determine
i) Value of 'R' and its current ii) Power consumed by 8Ω resistor. **(07 Marks)**

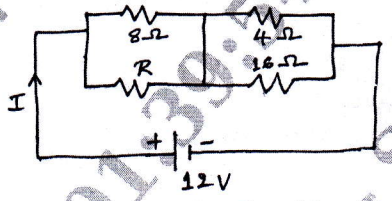

Fig. Q2(b)

c. Discuss about AC through pure inductive circuit with voltage and current waveforms. Also show that in a pure inductive circuit, average power is zero. **(07 Marks)**

Module-2

3 a. Discuss in detail about AC through series RL circuit with voltage and impedance triangles and also draw voltage and current waveforms. **(07 Marks)**

b. A circuit consists of 20Ω resistance in series with inductance of 0.05H. A supply of 230V, 50Hz is given to the circuit. Calculate i) Current ii) Phase angle iii) Power factor iv) Active power v) Reactive power. **(07 Marks)**

c. An impedance Z_1 consists of 10Ω resistance and 0.12H inductance in series. Impedance Z_2 consists of 20Ω resistance and 40μF capacitance in series. Z_1 & Z_2 are in parallel across 200V, 50Hz supply. Calculate i) Current in each branch ii) The supply current iii) Total power factor. **(06 Marks)**

OR

4 a. Establish the relationship between phase and line values of voltages and currents in a 3 phase, delta connected circuit with relevant phasor diagram, also derive equation for 3 phase power. **(08 Marks)**

b. Briefly explain the measurement of 3 phase power using two Wattmeter method. **(05 Marks)**

c. A 400V, 3 phase supply is connected across a star connected balanced load of three impedances each consisting of 32Ω resistance and 24Ω inductive reactance. Calculate i) Line current ii) True power iii) Apparent power iv) Reactive power. **(07 Marks)**

Module-3

5 a. Draw a neat labeled diagram, showing the construction of DC Generator and explain the functions of i) Yoke ii) Pole shoe. **(06 Marks)**

b. A 4 pole lap connected DC generator has armature with 60 slots and 10 conductors per slot runs at 1200 rpm with a total flux of 0.24 wb. Calculate i) Emf induced in generator ii) The speed at which it should be driven to produce the same Emf when armature is wave connected. **(06 Marks)**

c. Sketch and discuss about i) Torque Versus Armature current ii) Speed versus Armature current characteristics of both DC shunt and DC series motor, also mention its applications. **(08 Marks)**

OR

6 a. With neat diagrams, discuss about core and shell type of transformers. **(06 Marks)**

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

c. A 40 KVA single phase transformer has core loss of 450W and full load copper loss of 850W, if the power factor is 0.8, calculate i) Full load efficiency ii) Maximum efficiency at unity power factor iii) Load in KVA for maximum efficiency. **(08 Marks)**

Module-4

7 a. Explain the concept of rotating magnetic field and show that the resultant flux has a constant magnitude of $1.5\phi_m$ when measured at various angular positions. **(08 Marks)**

b. With neat sketch, explain the types of rotors of three phase Induction motor. **(06 Marks)**

c. A 3 phase induction motor has 6 poles and runs at 960 rpm on full load. It is supplied from an alternator having 4 poles and running at 1500 rpm. Calculate the full load slip and frequency of rotor currents of Induction motor. **(06 Marks)**

OR

8 a. Develop the expression for frequency of induced emf and hence derive the emf equation of synchronous generator. **(08 Marks)**

b. With neat sketch, explain the two types of rotors of synchronous generator. **(06 Marks)**

c. A 6 pole, 3 phase star connected alternator has an armature with 90 slots and 8 conductors per slot. It revolves at 1000 rpm, the flux being 50 mwb. Given the value of distribution factor is 0.97 and pitch factor is unity. Determine i) Frequency ii) Emf generated per phase iii) Line emf. **(06 Marks)**

Module-5

9 a. With a neat single line diagram of a typical AC power supply system, discuss about electric power supply system. **(08 Marks)**

b. Explain briefly the desirable characteristics of tariff and explain two part tariff. **(06 Marks)**

c. A consumer has maximum demand of 300 kW at 35% load factor. If tariff is Rs 125 per kW of maximum demand plus 15 paise per kwh, calculate overall cost per kwh. **(06 Marks)**

OR

10 a. Explain working principle of fuse and MCB with relevant circuit diagrams. **(07 Marks)**

b. What is Earthing? With a neat diagram, explain Pipe - earthing. **(07 Marks)**

c. Discuss about electric shock and precaution to be taken against it. **(06 Marks)**