CBCS SCHEME

USN 1 C R 1 6 E C 1 0 6

18ELE13/23

First/Second Semester B.E. Degree Examination, Dec.2024/Jan.2025
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 ohm's law and mention its limitations. **(06 Marks)**

b. For an alternating quantity, define :
(i) Frequency.
(ii) Average value.
(iii) Form factor.
(iv) Peak factor. **(06 Marks)**

c. Find the currents in the various branches of the given network shown below :

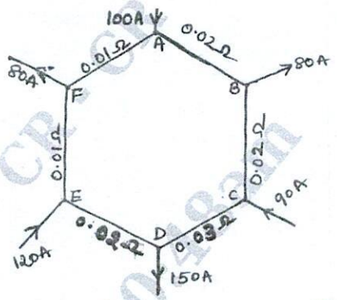

Fig. Q1 (c) **(08 Marks)**

OR

2 a. State and explain Kirchoff's laws with an example. **(06 Marks)**

b. For the circuit shown in Fig. Q2 (b), find
(i) Current in 20 Ω and 30 Ω
(ii) Voltage across whole circuit.
(iii) The total power and power consumed in all resistors.

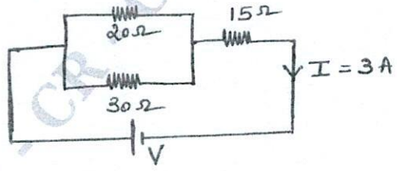

Fig. Q2 (b) **(06 Marks)**

c. Derive an expression for Average value and RMS value of sinusoidal varying quantities. **(08 Marks)**

Module-2

3 a. Show that power consumed by a pure inductor is zero. Draw the voltage, current and powe waveforms. **(06 Marks**

b. Mention the advantages of 3 phase system over single phase system. **(06 Marks**

c. A series circuit with resistance of 10 Ω, inductance of 0.2 H and capacitance of 40 μF is supplied with a 100 V at 50 Hz. Find the current, power, power factor of the circuit. **(08 Marks)**

OR

4 a. In a 3 phase star connection, find the relationship between line and phase values of current and voltage. **(06 Marks)**

b. Two impedances $Z_1 = (10 + j15)\Omega$ and $Z_2 = (6 - j8)\Omega$ are connected in parallel. If the total current is 15 A, find
(i) branch currents (ii) power taken by each branch (iii) Supply voltage. **(08 Marks)**

c. Three similar coils are connected in delta across a 3 phase supply. The 2 wattmeters connected to measure the input power indicate 12 kW and 7 kW. Calculate the
(i) Power input
(ii) Power factor **(06 Marks)**

Module-3

5 a. Derive emf equation of transformer. **(06 Marks)**

b. Find :
(i) The number of turns on primary and secondary side
(ii) The primary and secondary full load currents of a 20 KVA, 4400 V/230 V, 50 Hz, 1 phase transformer if the net area of cross section of the core is 30 cm^2 and the flux density is $2 wb/m^2$. **(06 Marks)**

c. With a neat circuit diagram and truth table, explain the working of 2-way and 3-way control of lamp. **(08 Marks)**

OR

6 a. Explain the various losses that occur in a transformer. **(06 Marks)**

b. Explain necessity of earthing. Explain any pipe earthing a neat diagram. **(08 Marks)**

c. The maximum efficiency at full load and unity power factor of a 1 phase, 25 KVA, 500/1000 V, 50 Hz transformer is 98%. Determine its efficiency at 25% of the load and 0.8 pf. **(06 Marks)**

Module-4

7 a. Derive EMF equation of D.C. Generator. **(06 Marks)**

b. List out the applications of shunt and series DC motors. **(06 Marks)**

c. A 4 pole DC shunt motor takes 22.5 A from a 250 V supply. R_a = 0.5 Ω and R_{sh} = 125 Ω. The armature is wave wound with 300 conductors. If the flux per pole is 0.02 wb. Calculate (i) Speed (ii) Torque developed (iii) Power developed. **(08 Marks)**

OR

8 a. Derive an expression for the armature torque developed in a dc motor. **(06 Marks)**

b. Explain with neat sketch the constructional features of a DC generator and mention the function of each part. **(08 Marks)**

c. An 8 pole DC generator has 500 armature conductors and has useful flux per pole of 0.065 wb. What will be emf generated if it is lap connected and runs at 1000 rpm? What must be speed at which it is to be driven to produce the same emf if it is wave connected? **(06 Marks)**

Module-5

9 a. Derive an EMF equation of the alternator. **(08 Marks)**

b. With neat figure, compare squirrel cage and slip ring type of rotor. **(06 Marks)**

c. A 2 pole, 3 phase alternator running at 3000 rpm has 42 armature slots with 2 conductors in each slot. Calculate (i) Frequency (ii) Flux/pole required to generate a phase voltage of 1100 V. Assume K_d = 0.97 and full pitch winding. **(06 Marks)**

OR

10 a. Explain the concept of rotating magnetic field in a 3 phase induction motor. **(08 Marks)**

b. With a neat figure, compare salient pole and non-salient pole type of Rotor. **(06 Marks)**

c. A 3 phase Induction motor is wound for 4 poles and is supplied from 50 Hz supply. Calculate : (i) Synchronous speed
(ii) The speed of the rotor when the slip is 4%
(iii) The rotor frequency when the speed of the rotor is 1450 rpm. **(06 Marks)**

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