CBCS SCHEME

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18ELE13/23

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
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. List out its limitations. **(06 Marks)**

b. For the figure shown in Fig.Q1(b), calculate the current in 2Ω resistor.

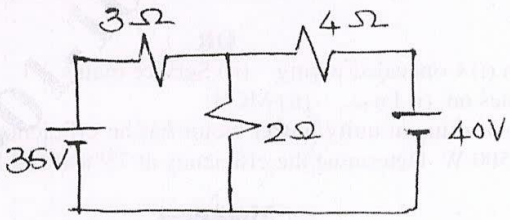

Fig.Q1(b) **(06 Marks)**

c. For the current wave, $e = 140\sin 314t$. Find:
(i) Peak current (ii) Average value (iii) Frequency
(iv) Time period (v) RMS value (vi) Instantaneous value at t = 3 ms
(vii) Form of factor (viii) Peak factor **(08 Marks)**

OR

2 a. State and explain Kirchoff's laws, as applied to D.C. circuit. **(06 Marks)**

b. Using series-parallel reduction, calculate the current supplied by the source for the circuit shown in Fig.Q2(b).

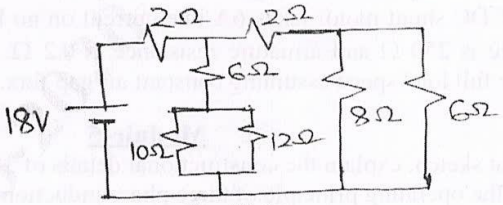

Fig.Q2(b) **(08 Marks)**

c. Derive the expression for RMS value of alternating quantity. **(06 Marks)**

Module-2

3 a. Show that power consumed by pure capacitor is zero. Draw the voltage, current and power waveform. **(07 Marks)**

b. Mention the advantages of 3-phase system over 1-phase system. **(05 Marks)**

c. A circuit consists of non-inductive resistance of 10Ω and inductance of 16 mH and a capacitance of 150 μF all connected in series. A supply of 100 V, 50 Hz is applied to the circuit. Find the current power factor and power consumed by the circuit. **(08 Marks)**

OR

4 a. Show that two wattmeters are sufficient to measure three phase power for a balanced star connected load. **(06 Marks)**

b. Derive an expression for impedance, phase angle and power for series R-L circuit supplied with AC. **(06 Marks)**

c. How is current 10A shared by three impedance $Z_1 = 2 - j5\,\Omega$, $Z_2 = 6.708\angle 26.56\,\Omega$, $Z_3 = 3 + j4\,\Omega$ all are connected in parallel? **(08 Marks)**

Module-3

5 a. State the principle of operation of transformer. Derive an expression for emf induced in transformer. **(06 Marks)**

b. Explain the operation of 3-way control of lamp with the help of diagram and functional table. **(06 Marks)**

c. Maximum efficiency at full load and unity power factor of a 1-phase, 25 kVA, 500/1000 V, 50 Hz transformer is 98%. Calculate its efficiency at: (i) 75% of full load, 0.9 p.f. (ii) 50% of full load, 0.8 p.f. (iii) 25% of full load, 0.6 p.f. **(08 Marks)**

OR

6 a. Briefly explain (i) Concealed wiring (ii) Service mains **(06 Marks)**

b. Write short notes on: (i) Fuse (ii) MCB **(06 Marks)**

c. A transformer working at unity power factor has an efficiency of 90% at both half load and at full load of 500 W. Determine the efficiency at 75% of full load. **(08 Marks)**

Module-4

7 a. With a neat diagram, explain the constructional details of DC Generator. **(06 Marks)**

b. Derive an equation of torque of DC motor. **(06 Marks)**

c. A 4-pole lap wound shunt generator delivers 200 A at terminal voltage of 250 V. It has field and armature resistance 50 Ω and 0.05 Ω respectively. Neglect brush drop. Calculate:
(i) Armature current (ii) Current per parallel path
(iii) emf generated (iv) Power developed **(08 Marks)**

OR

8 a. Explain the significance of back emf in DC motor. **(04 Marks)**

b. Derive an emf equation of DC generator. **(06 Marks)**

c. A 250 V DC shunt motor takes 6A line current on no load and runs at 1000 rpm. The field resistance is 250 Ω and armature resistance is 0.2 Ω. If the full load line current is 26A, calculate full load speed assuming constant air gap flux. **(10 Marks)**

Module-5

9 a. With neat sketch, explain the constructional details of 3-phase alternator. **(06 Marks)**

b. Explain the operating principle of three phase induction motor. **(06 Marks)**

c. A 6-pole, 3-phase star connected alternator has 90 slots and 8 conductors per slot and rotates at 1000 rpm. The flux per pole is 50 mWb. Find the induced emf across its lines. Assume winding factors of 0.97. **(08 Marks)**

OR

10 a. Explain the constructional details of 3-phase induction motor. Draw relevant sketches. **(08 Marks)**

b. Derive an expression for frequency of induced emf in case of 3-phase alternator. **(04 Marks)**

c. A 3-phase induction motor with 4-poles is supplied from an alternator having 6-poles and running at 1000 rpm. Calculate:
(i) Synchronous speed of induction motor (ii) Its speed when slip is 0.04
(iii) Frequency of rotor emf when speed is 600 rpm. **(08 Marks)**

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