First/Second Semester B.E. Degree Examination, Aug./Sept.2020

Basic Electrical Engineering

Wow 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  $2\Omega$  resistor.

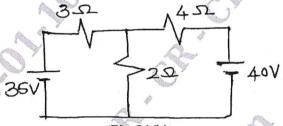


Fig.Q1(b)

(06 Marks)

- c. For the current wave,  $e = 140 \sin 314t$ . Find:
  - (i) Peak current
- (ii) Average value
- (iii) Frequency

- (iv) Time period (vii) Form of factor
- (v) RMS value (viii) Peak factor
- (vi) Instantaneous value at t = 3 ms

(08 Marks)

OR

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).

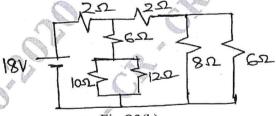


Fig.Q2(b)

(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

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Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice. Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.

## 18ELE13/23

Show that two wattmeters are sufficient to measure three phase power for a balanced star connected load. 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  $Z_1 = 2 - j5\Omega$ ,  $Z_2 = 6.708 | 26.56 \Omega$ ,  $Z_3 = 3 + j4\Omega$  all are connected in parallel? (08 Marks) Module-3 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 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 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  $\Omega$  and 0.05  $\Omega$  respectively. Neglect brush drop. Calculate: (i) Armature current (ii) Current per parallel path (iii) emf generated (iv) Power developed (08 Marks) OR 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  $\Omega$  and armature resistance is 0.2  $\Omega$ . If the full load line current is 26A, calculate full load speed assuming constant air gap flux. (10 Marks) Module-5 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) **CMRIT LIBRARY** OR BANGALORE - 560 037 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) \*\*\*\*