

First/Second Semester B.E./B.Tech. Degree Examination,  
Dec.2025/Jan.2026

**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. What are the advantages of parallel circuit? Obtain the expression for current through any resistor in a parallel circuit having three resistances. (06 Marks)
- b. Define :
  - i) Average value
  - ii) Form factor
  - iii) Peak factor
 Obtain their values for sinusoidally varying current. (06 Marks)
- c. Using Kirchoff's Laws, determine the voltage labeled,  $V_x$  in the circuit shown in Fig.Q1(c).

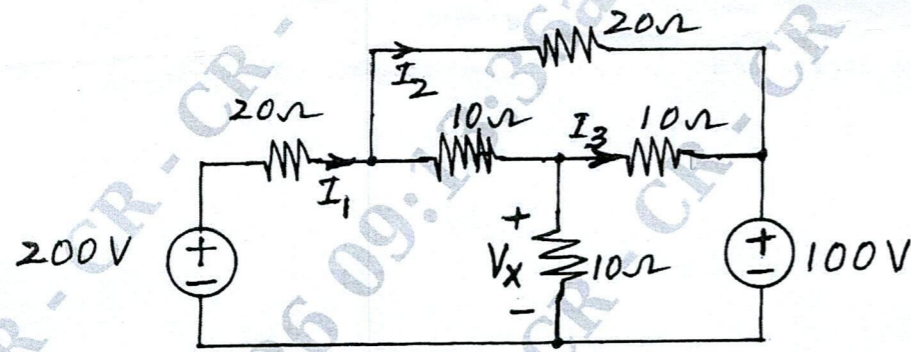


Fig.Q1(c)

(08 Marks)

OR

- 2 a. Define r.m.s value of an alternating quantity and find the relation with its maximum value. (06 Marks)
- b. A  $12\ \Omega$  resistance is in parallel with  $20\ \Omega$  resistance. This combination is connected in series with  $8\ \Omega$  resistance. If the whole circuit is connected across a battery having an e.m.f of 30 V and an internal resistance of  $2\ \Omega$ , Calculate :
  - i) The terminal voltage of the battery
  - ii) The energy in joules dissipated in the  $12\ \Omega$  resistance if the current remains constant for 4 min. (06 Marks)
- c. The instantaneous value of e.m.f across each of the three coils connected in series is given by  $e_1 = 20 \sin 471 t$  V,  $e_2 = 30 \sin (471 t - \pi/4)$  V and  $e_3 = 40 \cos (471 t + \pi/6)$  V. Find :
  - i) The expression for the resultant voltage
  - ii) The r.m.s value and the frequency of this voltage,
  - iii) What is its value at  $t = 0$ ? (08 Marks)

**Module-2**

- 3 a. Starting from fundamentals, show that in a purely capacitive circuit, average power consumed is zero. Draw :
  - i) the waveforms of voltage current and power
  - ii) the phasor diagram (06 Marks)
- b. List the advantages of three -phase system over single phase system. (06 Marks)
- c. A 230V, 50 Hz voltage is applied to a coil of  $L = 5$  H and  $R = 2\ \Omega$  in series with capacitance C. what value must C have in order that the p.d across the coil shall be 250 V? (08 Marks)

OR

- 4 a. With the help of connection diagram and phasor diagram show that two wattmeters are sufficient to measure the active power in a three-phase balanced star connected load. (08 Marks)
- b. Two circuits, A and B are connected in parallel across 200 V, 50 Hz supply. Circuit A consists  $10\ \Omega$  resistance and 0.12 H inductance in series while circuit B consists of  $20\ \Omega$  resistance and  $40\ \mu\text{F}$  capacitance. Calculate :
  - i) The current in each branch
  - ii) The supply current
  - iii) Total p.f. (06 Marks)
- c. Three similar inductors, each of resistance  $10\ \Omega$  and inductance 0.019 H, are delta connected to a 3-phase, 400 V, 50 Hz supply. Calculate :
  - i) The line current
  - ii) The power factor
  - iii) The active power
  - iv) The power consumed if the load were connected in star. (06 Marks)

**Module-3**

- 5 a. Define efficiency of a transformer. Derive the condition for which the efficiency of a transformer is maximum. (06 Marks)
- b. What is electric shock? What are the precautions to be taken to prevent electric shock? (06 Marks)
- c. A 600-KVA, single phase transformer has an efficiency of 92% both at full load and half full-load, u.p.f. Determine its efficiency at 75% of full load, 0.9 p.f. (08 Marks)

CMRIT LIBRARY  
BANGALORE - 560 037

OR

- 6 a. Why is earthing of electrical apparatus required? Explain. With a neat diagram, explain pipe earthing. (08 Marks)
- b. With relevant circuit diagram and switching table, explain three-way control of a lamp. Mention its applications. (06 Marks)
- c. A 500-KVA, 11KV/400V, 50 Hz, single phase transformer has 100 turns on the secondary winding. Calculate :
  - i) The number of turns on the primary winding
  - ii) The full load primary and secondary currents
  - iii) The maximum value of the flux in the core. (06 Marks)

**Module-4**

- 7 a. With a neat sketch, explain the constructional features of a DC machine. Mention the functions of each part. (08 Marks)
- b. Derive an expression for the torque developed in an armature of a DC motor. List the factors on which torque of a DC motor depends. (06 Marks)
- c. In a 110 V, 4-pole shunt generator with lap connected armature having armature and field resistances of  $0.1 \Omega$  and  $50 \Omega$  respectively. The load consists of 100 lamps each rated at 60 W, 110 V. Allow 1V per brush for contact drop. Find :
- The armature current
  - The total e.m.f generated. (06 Marks)

**OR**

- 8 a. Sketch and explain speed-load characteristics of i) Series motor ii) Shunt motor. Mention two applications of each motor. (06 Marks)
- b. An 8-pole, Lap connected armature has 48 slots with 20 conductors per slot, a flux of 40 m wb per pole, and a speed of 400 r.p.m. Calculate the e.m.f generated on open circuit. If the armature were wave connected at what speed must it be driven to generate 400 V? (06 Marks)
- c. A 240 V, 4-pole shunt motor running at 1000 r.p.m gives 15 h.p with an armature current of 50 A and a field current of 1A. The armature winding is wave connected and has 540 conductors. Its resistance is  $0.1 \Omega$  and the drop at each brush is 1V. find :
- The useful torque
  - The useful flux per pole
  - The gross torque developed by the armature (08 Marks)

**Module-5**

- 9 a. What is an alternator? With neat diagrams, explain the constructional features of a three phase alternator. (08 Marks)
- b. Define :
- Synchronous speed
  - Slip speed of a three-phase induction motor
- Explain why slip is never zero in an induction motor. (06 Marks)
- c. A 3-phase, 50 Hz 16-pole alternator with star connected winding has 144 slots with 10 conductors per slot. The flux per pole is 24.8 m wb and is sinusoidally distributed. The coils are full-pitched. Find : i) The speed ii) The line emf  
Assume the winding factor,  $K_d = 0.96$ . (06 Marks)

CMRIT LIBRARY  
BANGALORE - 560 037

**OR**

- 10 a. Explain the necessity of starter for 3-phase induction motor. With a neat sketch explain the working of star-delta starter. (08 Marks)
- b. Derive the emf equation for star connected three phase alternator. (06 Marks)
- c. A 6-pole alternator running at 1000 rpm supplies power to a 4-pole induction motor. The frequency of rotor of induction motor is 2 Hz. Determine the slip and speed of the motor. (06 Marks)

\* \* \* \* \*