H 1263

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2006.

Second Semester

Civil Engineering

EE 151 — ELECTRICAL ENGINEERING

(Common to Mechanical, Mechatronics, Metallurgical, Chemical Engineering, Fashion Technology, Industrial Bio Technology, Leather, Polymer, Textile Technology, Textile Chemistry)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Kirchoff's laws.

2. Define RMs value of an alternating current.

3. A current of 3A flows through a 10 Ω resistor.

   Find (a) the power developed by the resistor, and (b) the energy dissipated in 5 minutes.

4. Mention the two different components of core less in a transformer.

5. Classify synchronous machines as per the constructional aspects.

6. Mention the two different types of armature winding in a d.c machine.

7. Define the term "slip" in an induction motor.

8. Mention the two different types of moving iron instruments.

9. List the major components of a single phase induction type energy meter.

10. Define the term "power".

PART B — (5 × 16 = 80 marks)

11. (i) Explain the operation of a moving coil ammeter. (10)

    (ii) Mention the features of an induction type energy meter. (6)

12. (a) (i) An ac voltage of 50 Hz frequency has a peak value of 100 V. (1) Write an equation to calculate the instantaneous value of this voltage. (2) Write an equation for a current having a maximum value of 10 A and lagging the voltage wave by 45° (3) Find average and effective values of the voltage and the current. (8)

(ii) A 40 microfarad capacitor is connected to a 230 V 50 Hz ac supply. Determine capacitive reactances capacitive susceptance and the circuit current. (8)

Or

(b) A voltage given by the expression

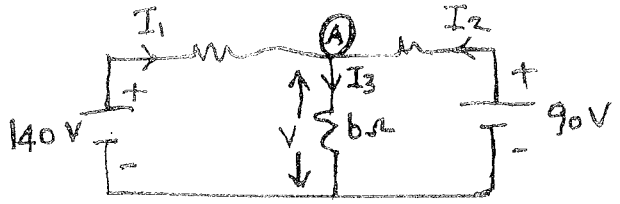
$e = 50 \sin \omega t + 20 \sin (3 \omega t + 20^\circ) + 10 \sin (5 \omega t - 80^\circ)$ volts,

When fed to a circuit, gives a current of the form,

$i = 0.5 \sin (\omega t - 37^\circ) + 0.1 \sin (3 \omega t - 25^\circ) + 0.09 \sin (5 \omega t - 140^\circ)$ Amp.

Find the total power supplied and overall power factor. (16)

13. (a) In the circuit given in Fig. Q.13 (a) Find voltage "V". Also show that power supplied by batteries is equal to power consumer by resistances. All resistances are in ohms.



(16)

Fig. Q. 13 (a)

Or

(b) Explain the operation of a d.c. generator, with neat sketch. (16)

14. (a) (i) Explain the principle of operation of a single phase transformer. (10)

(ii) Draw and explain the phasor diagram of a transformer. (6)

Or

(b) (i) A 3 phase, 6 pole, 50 Hz induction motor has a slip of 1% at no load and 3% at full load. Find (1) synchronous speed (2) no load speed (3) full load speed (4) frequency of rotor current at stand still (5) frequency of rotor current at full load. (10)

(ii) State the important differences between a transformer and induction motor. (6)

15. (a) Explain the construction and working of a three phase induction motor. (16)

Or

(b) (i) Explain why a synchronous motor develops torque only at synchronous speed, whereas an induction motor develops torque at all speeds except synchronous speed. (10)

(ii) Briefly discuss the phenomenon "Hunting" in a synchronous motor. (6)