

D 038

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2003.

Third Semester

Electronics and Communication Engineering

EE 253 — ELECTRICAL ENGINEERING

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Give the advantages of three phase transformer.
2. A sinusoidal flux 0.02 wb links with 55 turns of a transformer secondary coil. Calculate the rms value of the induced emf in the secondary. The supply frequency is 50 Hz.
3. List the main parts of a d.c. machine.
4. Draw the circuit diagram for conducting Swinburne test in a d.c. machine.
5. A three phase induction motor is wound for 4 poles and is supplied from 50 Hz system. Calculate :
 - (a) the synchronous speed
 - (b) the speed of the motor when slip is 4.1.
6. Draw the star delta starter diagram of three phase cage induction motor.
7. Define voltage regulation of alternator and its expression in terms of winding parameters.
8. Give the advantages of reluctance machines.
9. Mention the advantages of EHVDC systems.

10. Give the advantages of cables compared to overhead transmission lines.

PART B — (5 × 16 = 80 marks)

11. (i) Explain how the rotor rotates in three phase induction motor. (6)
- (ii) A 3 phase induction motor has a star connected rotor. The rotor emf (between slip rings) at standstill is 50 V. The rotor resistance and standstill reactance are 0.5Ω and 3Ω respectively. Find :
- (1) rotor current per phase at starting and the slip rings short circuited.
 - (2) rotor current per phase at starting if a star connected rheostat of resistance 6 ohms per phase is connected across the slip rings.
 - (3) full load rotor current and rotor power factor if the full load slip is 0.04.
 - (4) rotor emf per phase under full load condition. (10)
12. (a) (i) Show that the sum of the two wattmeter readings in three phase circuit measures the total power. Also show how will you calculate the power factor of the load in terms of wattmeter readings. (8)
- (ii) A 100 kVA, 1100/200 volt single phase transformer has the following parameters; $r_1 = 0.1 \Omega$, $x_1 = 0.3 \Omega$, $r_2 = 0.004 \Omega$, $x_2 = 0.012 \Omega$. Find equivalent resistance and leakage reactance as referred to high voltage winding. (8)

Or

- (b) A delta connected 3-phase load has a resistance of 6Ω and an inductive reactance of 8Ω in each branch. Line voltage is 220 V. Determine the phasor expressions for current through each branch and line currents. Also calculate the total power. (16)
13. (a) (i) Explain the speed control methods of d.c. motor. (8)
- (ii) Describe the brake test on d.c. motor to determine the efficiency characteristic of d.c. motor. (8)

Or

- (b) A 37.3 kW, 4 pole, 50 Hz induction motor has friction and windage losses of 3320 Watts. The stator losses equal the rotor losses. If the motor is delivering full load power output at a speed of 1440 rpm, calculate synchronous speed, slip, mechanical power developed by the motor, rotor

copper loss, power transferred from stator to rotor, stator power input and efficiency. (16)

14. (a) (i) What are the advantages of having stationary armature winding in three phase synchronous generator? (8)
- (ii) Explain the principle of operation of hysteresis motor. (8)

Or

- (b) (i) Derive the induced emf equation of an alternator. (8)
- (ii) Explain the principle of operation of permanent magnet synchronous machines. (8)
15. (a) (i) Explain the advantages of high transmission a.c. voltage. (8)
- (ii) Discuss the types of insulators. (8)

Or

- (b) (i) Explain the classification of sub-stations. (8)
- (ii) Explain the connection schemes of distribution system. (8)
