

**K 1197**

B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2004.

Third Semester

Electronics and Communication Engineering

EE 253 — ELECTRICAL ENGINEERING

Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

- Give the expressions for the power measured by 2 wattmeters each in a three phase circuit.
- What is the function of a transformer?
- Draw the mechanical characteristics (N & T) of D.C. shunt and series motors.
- List the important parts of a d.c. Starter.
- A 6 pole, 50 Hz, 3 phase Induction motor runs at 800 rpm at full load. Determine the value of slip at this load condition.
6. What are the different types of starters to be used in three phase induction motor?
  7. Write down any four advantages of short – pitch winding in synchronous machines.
  8. What are different types of stepper motor?
  9. What is the level of voltage for (a) Generation (b) Transmission and (c) Distribution?
  10. List the various types of cables and the operating voltages for each type.

11. (i) A balanced star connected load of  $(10 + j7) \Omega$  per phase is connected to a 3 phase, 400 V, 50 Hz supply. Find the line current, power factor, total volt ampere, Real power and reactive power. (6)
- (ii) Develop an approximate equivalent circuit for a two winding transformer. State the assumptions made. (6)
- (iii) A 100 KVA, 2.2 KV/220 V, 50 Hz transformer has an iron loss of 900 W and full load copper loss of 1000 W. Determine the efficiency at full load 0.8 pf. (4)
12. (a) (i) Explain the various types of D.C. motors with suitable diagrams showing the connection of field coils to armature. (8)
- (ii) A 500 V d.c. shunt motor has armature and field resistances of  $1.5 \Omega$  and  $400 \Omega$  respectively. When running on no load the current taken is 5 Amps and the speed is 1000 rpm. Calculate the speed when motor is fully loaded and the total current drawn from the supply is 30 Amps. Also estimate the speed at this load if the shunt field current is reduced by 15%. (8)
- Or
- (b) (i) Explain the performance characteristics of D.C. shunt motor. List the applications of this motor. (6 + 2)
- (ii) Why a starter is necessary? Explain the functions of no-volt coil and over load relays. (3 + 5)
13. (a) (i) Explain the principle of working of a 3 phase induction motor. State how the direction of rotation of the motor can be reversed. (8)
- (ii) The active power input to a 415 V, 50 Hz, 6 pole, 3 phase induction motor running at 970 rpm is 41 kW. The input power factor is 0.9. The stator losses amount to 1.1 kW and the mechanical losses total 1.2 kW. Calculate line current, slip, rotor copper loss, mechanical power output and efficiency. (8)

Or

- (b) (i) Develop the equivalent circuit for a 3 phase induction motor and obtain the expression for Input current in terms of circuit parameters. (6 + 2)
- (ii) With the help of a neat sketch, describe the principle of working of a star-delta starter for a 3 phase induction motor. When can this type of starter be used? (6 + 2)
- (a) (i) Discuss briefly the constructional features of cylindrical rotor alternator. Why do these alternators operate with high speed steam turbines. (8)

- (ii) Explain the principle of operation of hysteresis motor. (8)

Or

- (b) (i) Explain the principle of operation of permanent magnet stepper motor. (8)
- (ii) From the following test results, determine the voltage regulation of a 2000 V single phase alternator delivering a load current of 100 A at 0.8 lagging pf. Test results : An excitation of 2.5 A produces a current of 100 A in the stator winding on short circuit and an emf of 500 V on open circuit. Assume an effective resistance of  $0.8 \Omega$ . (8)

15. (a) (i) Explain the various types of insulators used in over head transmission system. (10)
- (ii) What are the advantages of EHVDC system? (6)

Or

- (b) (i) Sketch and explain the electric power system and mark the voltage level at various points from generator to load. (8)
- (ii) List the advantages and disadvantages of underground cables. (8)