A 257

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

Third Semester

Electronics and Communication Engineering

EE 253 — ELECTRICAL ENGINEERING

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Explain the term phase sequence and what is its significance?

2. Why the open circuit test on a transformer is conducted at rated voltage?

3. If speed is decreased in a DC motor. What happens to the back emf and armature current?

4. How a series motor develops high starting torque?

5. Define the term synchronous watt in an AC machine.

6. Draw the equivalent circuit of an Induction motor.

7. Name the various parts of an alternator.

8. Name the different type of single phase synchronous motor.

9. What are the principal divisions of an electric power system?

10. What are the major sources of energy used for generation of electric power?

PART B — ($5 \times 16 = 80$ marks)

11. (i) Define voltage regulation of a transformer. Deduce the equation for voltage regulation. (8)

(ii) An unbalanced four wire star connected load has balanced supply voltage of 400 volts. The load impedances are ZR = $4 + j8$ ohm, $ZY = 3 + j\,4$ ohm and $ZZ = 15 + j10$ ohm. Calculate the line currents, neutral current and the total power. (8)

12. (a) (i) Deduce the equation for the emf induced in a DC machine. (8)

(ii) A 230 V DC shunt motor takes an armature current of 20 A on a particular load. The armature circuit resistance is 0.5 ohm. Find the resistance required in series with the armature to reduce the speed by 50%, if the torque is constant. (8)

Or

(b) (i) Draw and explain torque – speed characteristics for the following types of DC motors (1) shunt motor (2) series motor. (8)

(ii) Explain any one method of speed control of DC machine in detail. (8)

13. (a) (i) Explain the principle of operation of induction motor in detail. (8)

(ii) The induced emf between the slip ring terminals of a three phase induction motor, when the rotor is standstill is 100 volts. The rotor winding is star connected and has resistance and standstill reactance of 0.05 ohm and 0.1 ohm per phase respectively. Calculate the voltage and rotor current at (1) 4% slip and (2) 100% slip. (8)

Or

(b) (i) Explain with the help of curves, the effect of variation of rotor circuit resistance on the torque-slip characteristics of an induction motor. (10)

(ii) The power input to a 500 V, 50 Hz, 6-pole, three phase induction motor running at 975 rpm is 40 kW. The stator losses are 1 kW and friction and windage loss total 2 kW. Calculate (1) the slip (2) the rotor copper loss (3) the efficiency. (6)

14. (a) (i) Explain the constructional details of a synchronous machine, giving reasons for making two different types of rotors. (8)

(ii) Explain synchronous impedance method of determination of voltage regulation of an alternator. (8)

Or

(b) Explain the constructional details, principle of operation and applications of the following special machines :

(i) Hysteresis motor

(ii) Stepper motor. (16)

15. (a) Draw the schematic diagram representing the structure of an electric power system and explain each module in detail. (16)

Or

(b) (i) Enumerate various types of insulators used in overhead transmission lines. (8)

(ii) Write short notes on : EHV DC transmission. (8)