N 1225

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

Fourth Semester

Electrical and Electronics Engineering

EE 234 — ELECTRICAL MACHINES – II

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the experimental data required for Potier method?

2. What are the reasons for the variation in the terminal voltage of a loaded alternator?

3. Name the three principal types of Synchronoscopes.

4. What constructional feature makes the flux distribution over the armature of a synchronous machine uniform in a salient role type rotor?

5. What are the two fundamental characteristics of a rotating magnetic field?

6. State the condition for maximum torque of a three phase induction motor. What is the maximum torque equal to?

7. A 3 phase, 4 pole, 50 Hz induction motor is running at 1440 rpm. Determine the slip speed and slip.

8. What is an induction generator?

9. Why capacitor–start induction motors advantageous?

10. List two specific applications of linear induction motor.

PART B — (5 × 16 = 80 marks)

11. (i) Two exactly similar turbo–alternators are rated at 25 MW each. They are running in parallel. The speed–load characteristics of the driving turbines are such that the frequency of alternator 1 drops uniformly from 50 Hz on no–load to 48 Hz on full–load, and that of alternator 2 from 50 Hz to 48.5 Hz. How will the two machines share a load of 30 MW? (8)

(ii) Make a comparison of the four methods used to predetermine the voltage regulation of synchronous machine. (8)

12. (a) Give short explanation on :

(i) Hunting of alternators. (6)

(ii) Synchronous impedance method. (10)

Or

(b) (i) Obtain the e.m.f. equation of a three phase alternator. (10)

(ii) A three phase, γ–connected 16 pole alternator has 192 slots with 8 conductors/slot, coil spain = 160, electrical degrees, speed of alternator = 375 rpm, flux/pole = 55 m Wb. Calculate the phase and line voltages. (6)

13. (a) (i) How is the circle diagram useful for estimating the working conditions of an induction motor? (10)

(ii) Explain about crawling and cogging. (6)

Or

(b) The following data refers to a 10–pole, 400 V, 50 Hz, 3 ph. induction motor :

$R_1 = 1.75\,\Omega$, $X_1 = 5.5\,\Omega$, $R'_2 = 2.25\,\Omega$, $X'_2 = 6.6\,\Omega$. When the motor is tested on no–load, it is observed that it tables 3.8 A (line current) and the total core loss is 310 W. By using an approximate equivalent circuit at 4% slip, calculate :

— the rotor current

— supply current and power factor

— mechanical power developed

— gross load torque

— determine the equivalent circuit. (16)

14. (a) (i) Explain the various techniques of speed control of induction motor from rotor side control. (10)

(ii) Describe the constructional details and operation of shaded–pole induction motor. (6)

Or

(b) Write brief notes on :

(i) Double squirrel cage motor. Explain its equivalent circuit. (6)

(ii) The ratio of maximum torque to full–load torque in a three phase squirrel cage induction motor is 22:1. Determine the ratio of actual starting torque of full load torque for Direct starting, Star–delta starting and Auto transformer starting with tapping of 70%. The rotor resistance and standstill reactance per phase are 0.5 Ω and 5 Ω respectively. (10)

15. (a) (i) Explain the operation of a single phase induction motor on the basis of double field revolving theory. (8)

(ii) Describe the construction and operation of permanent magnet DC motors. (8)

Or

(b) Explain the operation of the types of stepping motor. Compare them. State four applications of stepper motors. (16)
