

T 8189

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Fourth Semester

Electrical and Electronics Engineering

EE 1251 — ELECTRICAL MACHINES — II

(Common to B.E. (Part-Time) Third Semester Regulation 2005)

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are squirrel-cage windings of alternators? How and why are they used?
2. What are the methods by which zero p.f. lagging curve can be obtained?
3. Give the expression for the gross mechanical power developed by synchronous motor.
4. When is a synchronous motor said to be under-excited? What will be the p.f. at this condition?
5. A 12 pole, 3 phase alternator driven at a speed of 500 rpm, supplies power to an 8 pole, 3 phase induction motor. If the slip of the motor, at full load is 3%, calculate the full-load speed of the motor.
6. What are the tests to be performed on induction motor to obtain data necessary to draw the circle diagram?
7. List the salient characteristic features of double squirrel-cage motor.
8. Point out the disadvantages of rotor rheostat control to obtain variable speed of induction motor.
9. Name any two applications of shaded pole induction motors. Are they reversible speed motors?
10. Draw the equivalent circuit of a single phase induction motor without core loss.

PART B — (5 × 16 = 80 marks)

11. (a) Discuss the effects of alternator on load with relevance to various p.f. (16)

Or

- (b) (i) The open and short circuit test readings for a 3 phase, star connected 1000 kVA, 2000 V, 50 Hz, synchronous generator are :

Field, amperes	10	20	25	30	40	50
OC terminal voltage, V	800	1500	1760	2000	2350	2600
SC armature current, A	-	200	250	300	-	-

The armature effective resistance is 0.2Ω per phase. Draw the characteristic curves and estimate the full-load percentage regulation at 0.8 p.f. lagging and 0.8 p.f. leading. (8)

- (ii) Describe the concept of parallel operation of two alternators with identical speed/load characteristics. (8)
12. (a) (i) Explain the working of synchronous motor with different excitations. (8)
- (ii) A synchronous motor having 40% reactance and a negligible resistance is to be operated at rated load at r.p.f., 0.8 p.f. lag and 0.8 p.f. lead. What are the values of induced emf? (8)

Or

- (b) (i) List out the main characteristic features of synchronous motor. (6)
- (ii) Discuss about the V curves and its construction. (10)
13. (a) A 220 V, 3 phase, 4 pole, 50 Hz, Y connected induction motor is rated 3.73 kW. The equivalent circuit parameters are $R_1 = 0.45 \Omega$, $X_1 = 0.8 \Omega$, $R_2' = 0.4 \Omega$, $X_2' = 0.8 \Omega$, $B_0 = -\frac{1}{30} \bar{0}$. The stator core loss is 50 W and rotational loss is 150 W. For a slip of 0.04, find input current, pf, air-gap power, mechanical power, electromagnetic torque, output power and efficiency. Draw the equivalent circuit and represent the parameters given. (16)

Or

- (b) (i) Draw the circle diagram for a 5.6 kW, 400 V, 3 phase, 4 pole, 50 Hz slip ring induction motor :
no load readings : 400 V, 6 A, $\cos P_0 = 0.087$
SC test : 100 V, 12 A, 720 W
The ratio of primary to secondary turns is 2.62.
Stator resistance per phase is 0.67Ω and of the rotor is 0.185Ω .
Calculate full load current and maximum output. (8)
- (ii) Write a note on induction generator. (4)
- (iii) Draw the T-s characteristics of induction motor and note down salient points. (4)
14. (a) Explain the various schemes of starting squirrel cage induction motor. (16)

Or

- (b) (i) The rotor of a 4 pole, 50 Hz slip ring induction motor has a resistance of 0.3Ω per phase and runs at 1440 rpm at full load. Calculate the external resistance per phase which must be added to lower the speed to 1320 rpm, the torque being the same as before. (6)
- (ii) Explain the cascade operation of induction motors to obtain variable speed. (10)
15. (a) (i) Explain the double revolving field theory for operation of single phase induction motor. (8)
- (ii) Give the constructional details and operating principle of AC series motor. (8)

Or

- (b) (i) What are the types of single phase induction motors? Explain any two in detail. (8)
- (ii) Write a brief note on hysteresis motor. (8)