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Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2004

EE 2K 505/PTEE 2K 405–ELECTRICAL MACHINES–II

(New Scheme)

Time : Three Hours

Maximum : 100 Marks

I. (a) What are the different types of losses present in alternator and how they are determined ?

(b) How the synchronous generator (or) alternators are classified ? How the alternators are selected for a particular application ?

(c) Explain what is the necessity of parallel operation of alternator.

(d) What is meant by hunting and how it is minimized ?

(e) Write short notes on :–

(a) Cogging. (b) Crawling.

(f) Name the applications of

(a) Three phase Induction motor (b) Single phase induction motor.

(g) How the speed of an induction motor is controlled by rotor resistance ?

(h) With neat diagram, explain direct on line starting.

(8 × 5 = 40 marks)

II. (a) A 100 kVA, 3000 V, 50 Hz 3 phase star connected alternator has effective armature resistance of 0.2 Ω. The field current of 40 A produces short–circuit current of 200 A and an open circuit emf of 1040 V (line value). Calculate the full load voltage regulation at 0.8 p.f. lagging and 0.8 p.f. leading. Draw phasor diagrams.

(15 marks)

Or

(b) Explain the constructional details and principle of operation of salient pole alternator.

(15 marks)

III. (a) A 3.5 MVA, slow speed, 3 phase alternator rated at 6.6 kV has 32 poles. Its direct and quadrature axis synchronous reactances as measured by sliptest are 9.6 Ω and 6 Ω respectively. Neglecting armature resistance, determine the regulation and excitation emf needed to maintain 6.6 kV at the terminals when supplying a load of 2.5 MW at 0.8 p.f. lagging. What maximum power can generator supply at rated terminal voltage, if the field become open circuited.

(15 marks)

Or

(b) Explain V curves and inverted V curves as applied to synchronous motor.

(15 marks)

Turn over

IV. (a) A 415 V, 29.84 KW, 50 Hz, delta connected induction motor gave the following test results

No load test :	415 V	21 A	1250 W.
Blocked rotor test :	100 V	45 A	2730 W.

Construct the circle diagram and determine (a) Line current and powerfactor for rated output (b) the maximum torque. Assume stator and rotor Cu losses equal at standstill.

(15 marks)

Or

(b) A 7.5 KW, 230 V, 3 phase star connected, 50 Hz, 4 pole Squirrel cage induction motor has its full load internal torque at a slip of 0.04. The parameters of the motor are $R_1 = 0.36\ \Omega$/Ph ; $R_2 = 0.222\ \Omega$/phase ; $X_1 = X_2 = 0.47\ \Omega$/Ph ; Xm = 15.5 Ω/phase. Assume that the shunt branch is connected across the supply terminals. Find (a) maximum internal torque at rated voltage and frequency (b) slip at maximum torque (c) internal starting torque at rated voltage and frequency.

(15 marks)

V. (a) A 3 phase 400 V, 50 Hz, 4 pole induction motor stator and rotor star connected has rotor resistance of 0.3 Ω and standstill reactance of 1 Ω. The ratio of stator to rotor turns is 1.25. If the full load slip is 4 %. Calculate the following :–

(a) Torque developed

(b) HP developed.

(c) (i) Ratio of starting torque to maximum torque.

(ii) Ratio of maximum torque to full load torque.

(iii) Ratio of starting torque to full load torque.

(iv) Speed at which maximum torque takes place.

(15 marks)

Or

(b) (i) A 230 V, 380 W, 50 Hz, 4 pole single phase induction motor gave the following results :

No load test :	230	84W	2.8A
Blocked rotor test :	110	460 W	6.2A

The stator winding resistance is 4.6 Ω and during the blocked rotor test auxillary winding is open. Determine the equivalent circuit parameters.

(8 marks)

(ii) Design the 5 sections of 6 stud rotor starter for a 3 θ wound rotor inductin motor. The slip at full load is 2 % and the starting current is 1.5 times the full load current. The resistance of rotor is 0.02 Ω/phase.

(7 marks)