EE

D 42110 (Pages : 2) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2007

Electrical and Electronics

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

Time : Three Hours Maximum : 100 Marks

Part A

I. 1 Draw and explain the shape of the current waveforms when an alternator is subjected to a sudden short circuit at its terminals.

2 What is armature reaction ? What is the effect of p.f. on armature reaction ?

3 Explain V and inverted V curves of a synchronous motor.

4 What is 'hunting' in a synchronous machine ? How can it be prevented ?

5 What is 'cogging' and 'crawling' in induction motors ?

6 Draw the equivalent circuit of an induction motor and mark all parameters.

7 Explain slip-recovery method of speed control of induction motors.

8 Give the representation of a D.C. machine using generalized machine theory.

(8 × 5 = 40 marks)

Part B

II. (a) A 3-ϕ star connected alternator is rated at 1600 kVA, 13500 V. The armature resistance and synchronous reactance are 1.5 Ω and 30 Ω per phase. Calculate the % regulation for a load of 1280 kW at p.f. of 0.8 leading.

(8 marks)

(b) Explain brush less excitation of synchronous machines. (7 marks)

Or

(c) Explain the Potier method of determining the voltage regulation of an alternator.

(7 marks)

(d) Explain 'slip test'. How can it be used to determine the voltage regulation of a salient pole alternator ?

(8 marks)

III. (a) Explain the operation of a synchronous motor when it is working under the following conditions :—

(i) Constant load, varying excitation.

(ii) Constant excitation, varying load.

(8 marks)

Turn over

(b) A 6,600 V, 3-ϕ, star-connected synchronous motor draws a full-load current of 80 A at 0.8 p.f. leading. The armature resistance is 2.2 Ω and synchronous reactance 22 Ω/phase. If the stray losses of the machine are 3200 W, determine :

(i) The e.m.f. induced. (ii) The output power.

(iii) Efficiency.

(7 marks)

Or

(c) A 3-ϕ, star-connected synchronous alternator with R = 0.4 Ω and X = 6 Ω/phase delivers 300 A at 0.8 p.f. to constant frequency 10 kV busbars. If the steam supply is unchanged, find the % change in the induced e.m.f. necessary to raise the p.f. to unity. Ignore change in losses.

(9 marks)

(d) Draw and explain the O-curves of a synchronous machine. (6 marks)

IV. (a) Using double field revolving theory, show that a 1-ϕ induction motor is not self-starting.

(6 marks)

(b) Determine the equivalent circuit of a 3-ϕ induction motor from the following test results.

No load test : 400 V, 9.5 A, 1400 W.

Blocked rotor test : 200 V, 50 A, 7000 W.

(9 marks)

Or

(c) Explain the principle of operation of a linear induction motor. (6 marks)

(d) Describe the method of drawing the circle diagram from the test results. How can it be used to determine the maximum torque, output and efficiency ?

(9 marks)

V. (a) Derive an expression for power and torque in a D.C. machine using generalized machine theory.

(8 marks)

(b) Explain with the help of a neat diagram star-delta method of starting induction motors ?

(7 marks)

Or

(c) What are the methods used for the starting of 1-ϕ induction motors ? (7 marks)

(d) A 3-ϕ delta connected cage type induction motor when connected directly to 400 V, 50 Hz supply takes a current of 100 A in each stator phase. Calculate :

(i) The line current for direct on line starting.

(ii) Line and phase starting currents for star delta starting.

(iii) Line and phase starting currents for a 70 % tapping on autotransformer starting.

(8 marks)

[4 × 15 = 60 marks]