Total No. of Questions : 10] [Total No. of Printed Pages : 4

Roll No. .....

EX–503(O)

B. E. (Fifth Semester) EXAMINATION, Dec., 2009

(Old Scheme)

(Electrical & Electronics Engg. Branch)

E. M. E. C.–II

[EX–503(O)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt any *five* questions. Only *one* question to be answered from each Unit for 20 marks only.

Unit–I

1. (a) Derive e. m. f. equation of alternator and explain coil span factor and distribution factor. 10

   (b) The flux distribution curve of a smooth core, 50 Hz generator is $B = 10 \sin\theta + 2 \sin 3\theta + 2 \sin 5\theta + 2 \sin 7\theta$ kilo-gauss when θ is measured from the neutral axis. The pole pitch is 35 cm, the core length 32 cm and the stator coil span four-fifth of the pole pitch. Determine the equation for the e. m. f. induced in one turn and its r. m. s. value. 10

P. T. O.

Or

2. (a) Explain the O. C. and S. C. tests of an alternator. How regulation can be calculated by use at their results ? 10

(b) A 3-phase, star connected, 1000 kVA, 11000 V alternator has rated current of 52·5 Amp. The a. c. resistance of the winding per phase is 0·45 ohm. The test results are given below : 10

O. C. Test : Field current = 12·5 Amp.

Voltage between lines = 422 Volts

S. C. Test : Field current = 12·5 Amp.

Line current = 52·5 Amp.

Determine the full-load voltage regulation of the alternator at :

(i) 0·8 p. f. lagging

(ii) 0·8 p. f. leading.

Unit—II

3. (a) Derive an expression for finding regulation of salient pole alternator using two reaction theory. Draw its phasor diagram. 10

(b) A 3-phase synchronous generator has per phase a direct axis synchronous reactance of 1·0 P. U. and a quadrature axis synchronous reactance of 0·65 P. U. Draw a phasor diagram of the machine when operating at full-load at a p. f. of 0·8 lagging and estimate from there : 10

(i) The load angle

(ii) P. U. no-load e. m. f.

Neglect armature resistance.

Or

4. (a) Two alternators are running in parallel and sharing a load in desired proportion. Explain what will happen if : 10

   (i) The excitations of alternator are changed while their prime mover inputs are fixed.

   (ii) The prime mover inputs are varied while the excitations are kept fixed.

   (b) Two similar 400 V, 3-phase alternator share equal kW power delivered to a balanced 3-phase, 50 kW, 0·8 p. f. lagging load. If the power factor of one machine is 0·95 lagging, find the power factor and the current supplied by the other machine. 10

Unit – III

5. (a) Explain why the speed of a 3-phase synchronous motor remains constant at various loads when fed from a constant frequency. 10

   (b) A 3-phase synchronous motor absorbing 60 kW is connected in parallel with factory load of 240 kW having lagging power factor of 0·8. If the combined load has a p. f. of 0·9, what is the value of the leading KVAR supplied by the motor and at what power factor is it working ? 10

Or

6. (a) Draw a phasor diagram of a synchronous motor. Explain the effect of (i) change in excitation if load is constant, (ii) change in load if excitation is constant. 10

   (b) A 400 V, 10 HP, 3-phase synchronous motor has negligible armature resistance and synchronous reactance of 10 ohm per phase. Determine the minimum current and corresponding induced e. m. f. for full-load condition. Assume an efficiency of 85%. 10

Unit – IV

7. Draw the (i) basic two pole machine diagram and (ii) primitive machine diagram for synchronous machine with amourtisserurs. Describe how these are obtained ? 20

Or

8. Explain the term 'invariance of power' as applied to electrical machines.

   On what basis are the linear transformations carried out in electrical machines ? Explain. 20

Unit – V

9. (a) Draw and explain a typical torque speed characteristic of a reluctance motor. Compare a reluctance motor with an equivalent induction motor. 10

   (b) Explain the operating principle of linear induction motor. What is equivalent to synchronous speed of a rotating induction motor ? State its applications. 10

Or

10. (a) Describe the operation of a variable reluctance type stepper motor. What is microstepping ? 10

    (b) Describe the construction of PMDC motor. What are the advantages and disadvantages of permanent magnet d. c. motors compared with conventional d. c. shunt motor ? 10