8. (a) Write short notes on any *two* of the following : 10

(i) Stepper motors

(ii) Repulsion motors

(iii) Servomotors

(iv) Brushless DC motors

(b) Why single phase induction motor is not a self starting motor ? Explain various starting methods of single phase induction motor. 10

Total No. of Questions : 8] [Total No. of Printed Pages : 4

Roll No. .....

EX–503(N)

B. E. (Fifth Semester) EXAMINATION, June, 2011

(Electrical and Electronics Engg. Branch)

ELECTRICAL MACHINE – II

[EX – 503(N)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt any *five* questions. All questions carry equal marks. Assume suitable data wherever necessary.

1. (a) Derive the emf equation of an alternator defining distribution factor and coil span factor. How do these factors eliminate harmonics ? 10

(b) A 4 pole, 3 phase, 50 Hz, star connected alternator has 60 slots with 4 conductors per slot. Coils are short pitched by 3 slots. If the phase spread is 60°, find the line voltage induced for a flux per pole of 0·943 Wb. distributed sinusoidally. All the turns per phase are in series. 10

2. (a) Draw and explain the equivalent circuit and phasor diagram of a turboalternator. 8

(b) The following figures give the open circuit and full load ZPF curves for a 15000 KVA, 11000 V, 3 phase, 50 Hz star connected alternator :

Field AT in 10^3	OC line KV	Zero pf full load line KV
10	4·9	—
18	8·4	0
24	10·1	—
30	11·5	—
40	12·8	—
45	13·3	10·2
50	13·65	—

Find the armature reaction, the armature leakage reactance and synchronous reactance. Deduce the regulation for full load at 0·8 pf lagging. 12

3. (a) Differentiate between the following with the help of neat sketches :. 4 each

(i) Salient and non-salient pole alternator

(ii) Full pitch and short pitch windings

(iii) Open circuit characteristics and short circuit characteristics.

What is air gap line ?

(b) With the help of a neat schematic arrangement explain the Brushless excitation system of a turbo alternator. List the advantages of this excitation system. 8

4. (a) Discuss along with a neat experimental set up the laboratory method of determining the direct axis and quadrature axis synchronous reactance. Draw appropriate diagrams. 10

(b) A synchronous motor is used to improve the power factor from 0·85 to 1. The circuit draws 22 A at 520 V, 50 Hz. Determine the power input in KVA required to the motor to run a mechanical load of 12 hp (metric). Calculate the power factor. The efficiency of the motor may be assumed 86%. 10

5. (a) With the help of neat diagrams and approximate equivalent circuit diagrams explain how various reactances and time constants are determined from the 3 phase short circuit armature current oscillogram. 10

(b) Two identical 3 phase alternators operating in parallel share equally a load of 1000 kW at 6600 V and at 0·8 lagging pf. The field excitation of the first machine is adjusted so that the armature current is 50 A at lagging pf. Determine (i) the armature circuit of the second alternator (ii) the pf at which each machine operates. 10

6. (a) What is a connection matrix ? Explain with a suitable example its use for obtaining the transformed or new impedance matrix and new voltage matrix. Also give the advantages of using connection matrix. 10

(b) Obtain identical transformations for currents and voltages from a rotating balanced 3-phase (a, b, c) winding to a rotating balanced 2 phase (α, β) winding. Show that the power invariance is maintained under this transformation. 10

7. (a) Explain with the help of a neat experimental set up how V and inverted V curves are plotted in laboratory stating their significance. 10

(b) Explain the terms synchronising current, synchronising power and synchronising power coefficient and synchronising torque coefficient. 10