SRK/KW/14/7069

Faculty of Engineering & Technology

Fifth Semester B.E. (Electrical Engg.) (C.B.S.)

Examination

ELECTRICAL MACHINE—II

Time : Three Hours] [Maximum Marks : 80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Due credit will be given to neatness and adequate dimensions.

(3) Assume suitable data wherever necessary.

(4) Illustrate your answers wherever necessary with the help of neat sketches.

(5) Use of Slide rule, Logarithmic tables, Non-programmable calculator, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.

1. (a) Compare cylindrical rotor synchronous generator with salient pole rotor synchronous generator. 6

(b) In a 3 phase, star connected alternator, there are two coil sides per slot and 16 turns per coil. Armature has 288 slots on periphery. When driven at 250 rpm it produces 6600 V between the lines at 50 Hz. The pitch of the coil is 2 slots less than the full pitch. Calculate the flux per pole. 7

OR

2. (a) Define short pitch winding. Mention its advantages. 5

(b) Calculate the RMS value of the induced emf/phase of a 10 pole, 3 phase, 50 Hz alternator with 3 slots/pole phase and 4 conductors/slot in two layers. The coil span is 130°. The flux pole has a fundamental component of 0.3 wb and a third component of 20%. 8

3. (a) State assumptions made for EMF method (Synchronous Impedance Method) of finding regulation of synchronous generator which introduce considerable error 6

(b) A 3 phase, 1500 KVA, 50 Hz, star connected, 2300 V alternator has a resistance between each pair of terminals as measured by direct current is 0.1 to 2. Assume that effective resistance is 1.5 times the ohmic resistance. A field current of 70 A produces a short circuit current equal to full load current of 376 A in each line. The same field current produces an emf of 700 V on open circuit. Determine the synchronous reactance of the machine and its full load regulation of 0.8 pf lagging 8

OR

4. (a) What is mean by zero power factor characteristics ? Explain its significance. 4

(b) A 500 KVA, 6600 V, 3 phase, star connected alternator has a resistance of 0.75 Ω per phase. Estimate by zero power factor method the regulation for a load of 500 A at 0.9 leading power factor from following data

Field Current (Amp)	Open Circuit Terminal Voltage	Zero Power Factor Voltage
32	3100	0
50	4900	1850
75	6600	4250
100	7500	5800
140	8300	7000

10

5. (a) Compare alternator with low value of SCR with high value of SCR (Short Circuit Ratio). 6

(b) Define negative sequence and zero sequence reactance of a synchronous machine and explain laboratory method of their measurement. 7

OR

6. (a) Write short note on synchronization of Alternators 6

(b) Explain slip test to find X_d and X_q in laboratory. What will happen if the rotor is rotated in a direction opposite to that of the stator (armature) mmf ? 7

7. (a) Compare 3ϕ Synchronous motor with 3ϕ Induction motor. 6

(b) A 3980 V, 50 Hz, 4 pole, star connected synchronous motor generates back emf of 1790 V per phase. The resistance and synchronous reactance per phase are 2-2 Ω and 22 Ω respectively. The torque angle is 30 degree electrical. Calculate :

(i) The resultant armature voltage

(ii) Armature current per phase

(iii) Power factor of motor

(iv) Gross torque developed by the motor.

OR

8 (a) Derive the expression for obtaining Power-Angle characteristic of salient pole generator. Hence explain what do you mean by reluctance power ? 7

(b) What do you mean by normal excitation, over excitation and under excitation ? Comment on power factor of synchronous generator when it is operated in under excitation and over excitation condition. 6

9. (a) Draw the oscillogram for short circuit current when 3 phase short circuit occurs on unloaded alternator for phase 'a'.

(Assume d.c. offset current = 0).

Explain how second harmonic currents are induced and why d.c. offset current is different in phases a, b and c. 7

(b) Write short note on damper winding. 6

OR

10. (a) Define sub transient, transient and steady state reactances giving equivalent circuit. How can these reactances be found from oscillogram ? 7

(b) Write short note on Hunting of Synchronous Generator. 6

11. Write short notes on :

(1) AC Series Motor 7

(2) Hysteresis Motor. 7

OR

12. Write short notes on :

(1) BLDC Motor 7

(2) Repulsion Motor. 7