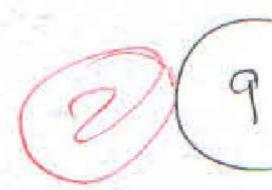
T.E. Electrical

VI CBSGS Time: 3 Hours Q.P.Code:13623 22.5-17 Total Marks:80

02+40+40+02



Q.1 is compulsory.

Solve ANY THREE questions out of remaining.

ASSUME SUITABLE DATA wherever necessary.

Q.1)

(20Marks)

- a) List down advantages of modeling of electrical machines.
- b) Draw phasor diagram for salient pole alternator for leading power factor.
- c) Derive the condition for maximum output power in case of an alternator.
- d) Why short circuit characteristics for an alternator is a straight line?

Q.2)

(20Marks)

- a) Write a short note on 'Synchronising Power'.
- b) A 3 phase; star connected; 11kV 12pole 50Hz synchronous motor has d-axis and q-axis reactances as 5Ω and 3Ω per phase respectively. At certain load the motor draws 20MW at unity power factor. Compute (i) Excitation e.m.f. (ii) Synchronising power coefficient in watts per <sup>0</sup>E and (iii) Synchronising power coefficient in watts per <sup>0</sup>M. Neglect armature resistance.

Q.3)

(20Marks)

- a) Write a short note on 'Synchronous Impedance'.
- b) A 3 phase; 440V; 50Hz delta connected alternator with negligible armature resistance has daxis synchronous reactance as  $0.12\Omega$  and q-axis reactance as  $0.09\Omega$  per phase. If the alternator supplies 900A at 0.8 lagging power factor calculate (i) Excitation e.m.f. neglecting effect of saliency, assuming  $X_s = X_d$  and (ii) Excitation e.m.f. considering saliency.

Q.4)

(20Marks)

- a) Derive the conditions for maximum power input and maximum power output of synchronous generator.
- b) A 3 phase; delta connected synchronous motor takes 50kW at 0.8 power factor lagging from a 415V bus bar. The induced e.m.f. is increased by 40%, the real power taken remaining the same. Find new current and power factor if synchronous impedance is  $(0.2 + j3)\Omega$  per phase.

Q.5)

(20Marks)

- a) Explain the effect of change in excitation on two alternators connected in parallel operating under loaded condition.
- b) Two identical 3000KVA alternators operate in parallel. The governors of alternator 1 is so adjusted that its frequency drops uniformly from 50 Hz at no load to 48 Hz at full load while the change in frequencies for alternator 2 is from 50 Hz to 47.5 Hz. Determine the maximum load that can be shared at unity p.f. without overloading either machine.

Q.6) Write short note on

(20Marks)

- a) Derive basic machine relation in 'd-q'variables for an induction machine.
- b) Explain the concept of 'power circle for synchronous motor and prove that efficiency at maximum output is 50%.