(3 Hours) **(Maximum Marks 80)**

Note:-
1. Q.1 is compulsory
2. Solve ANY THREE questions out of remaining.
 3. ASSUME SUITABLE DATA wherever necessary.

Q.1 (20)
a) Derive an expression for distribution factor Kd.
b) Explain operating principle of BLDC.
c) Explain nature of OCC and SCC of an alternator.
d) Explain any one method of starting of synchronous motor.

Q.2 (20)
a) Explain armature reaction in synchronous alternator for different power factor loads.

b) A three phase 8 pole, 750rpm star connected synchronous alternator has 72 slots having 12 conductors per slot. Winding is chorded by 2 slots. Find distribution factor and pitch factor for the winding. Also find line voltage induced if flux is 0.06Wb.

Q.3 (20)
a) Explain hunting in synchronous machines.
b) A 20MVA three phase 11KV, 12 pole, 50Hz salient pole synchronous motor with negligible armature resistance has reactance $X_d=5$ ohms and $X_q=3$ ohms, at full load, unity power factor and rated voltage find excitation voltage and power.

Q.4 (20)
a) A 3300kVA, 3 phase, star connected 6600V, 8 pole, 50Hz, cylindrical alternator has synchronous reactance of 20% and it is running parallel with infinite bus. Calculate synchronizing power and corresponding synchronizing torque per mechanical degree of phase displacement i) at no load ii) At full load 0.8 pf lag.
b) Explain V curves of synchronous motor. Draw phasor diagram.

Q.5 (20)
a) Explain Blondel's two reaction theory.
b) Explain slip test to calculate Xd and Xq.

Q. 6 (20)
a) Explain power angle characteristics for salient pole synchronous machine.
b) Explain excitation circles and power circles.

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