

(3 Hours)

[Total Marks : 80]

N.B.1: Q No 1 is compulsory

2: Attempt any three from the remaining questions.

3. Full marks of each question is indicated there ahead

4. Assume data if necessary & justify

- Q1 a Derive EMF equation of alternator for full pitched and concentrated windings 5
 b Explain in brief hunting in synchronous motor 5
 c Explain in brief steady state analysis of synchronous machine 5
 d Draw & explain the primitive representation of Induction Machine 5
- Q2 a Derive an expression for power developed in salient pole machine acting as a Generator. What are the components of power? 10
 b Explain the principle of operation of the synchronous motor and draw phasor diagram of salient pole synchronous motor for lagging & leading power factor 10
- Q3 a A 400 V, 50 kVA, 50 Hz, 3-phase star-connected alternator has the armature resistance of 0.1Ω per phase. An excitation of 25 A produces on open circuit EMF of 130 V(line). The same excitation produces a current of 90 A on short circuit, calculate (a) the synchronous impedance & reactance. (b) the full load regulation of the alternator for (i) 0.866 lagging power factor (ii) unity power factor. 10
 b Derive the condition for maximum power output of synchronous motor and hence deduce an expression for maximum power output. 10
- Q4 a Explain the terms, direct-axis synchronous reactance & quadrature-axis synchronous reactance of a salient pole alternator and hence describe the slip test method for the measurement of X_d and X_q of synchronous machines. 10
 b. A 3-phase 40 kW, 400 V, 50 Hz star-connected synchronous motor has a full load efficiency of 90%. The synchronous impedance of the motor is $(0.25 + j12) \Omega$ per phase. If the excitation of the motor is adjusted to give a leading power factor of 0.8, calculate the induced EMF and total mechanical power developed at full load. 10
- Q5 a. Explain the effect of changing excitation on output power of the alternator connected to infinite bus. 10
 b. Explain excitation circle and power circle in synchronous motor 10
- Q6 Write Short Notes on 20
 a. Starting of synchronous motor against high torque
 b. Ideal synchronous machine

X ————— X