(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   10
Generator. What are the components of power?

    b   Explain the principle of operation of the synchronous motor and draw phasor diagram   10
of salient pole synchronous motor for lagging & leading power factor

Q3 a   A 400 V, 50 kVA, 50 Hz, 3-phase star-connected alternator has the armature   10
resistance of 0.1 Ω 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.

    b   Derive the condition for maximum power output of synchronous motor and hence   10
deduce an expression for maximum power output.

Q4 a   Explain the terms, direct-axis synchronous reactance & quadrature-axis synchronous   10
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.

    b. A 3-phase 40 kW, 400 V, 50 Hz star-connected synchronous motor has a full load   10
efficiency of 90%. The synchronous impedance of the motor is $(0.25+j12)Ω$ 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.

Q5 a. Explain the effect of changing excitation on output power of the alternator connected   10
to infinite bus.

    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

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