Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY
Winter Examination-2015

Subject Name: Electrical Machine - III

Subject Code: 4TE05EMC1 Branch: B.Tech (Electrical)

Semester: 5 Date: 09/12/2015 Time: 2.30 To5.30 Marks: 70

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 Attempt the following questions: (14)

a) Why do hybrid stepping motors have many phases sometime more than six?

b) The rotor of a stepper motor has
(i) no windings (ii) no commutator
(iii) no brushes (iv) all of the above

c) The electric motor used in domestic mixers is
(i) universal motor (ii) shaded pole motor
(iii) capacitor start motor (iv) hysteresis motor

d) Synchronous capacitor is
(i) An ordinary static capacitor bank
(ii)An over excited synchronous motor running without mechanical load
(iii)An over excited synchronous motor driving mechanical load
(iv) None of the above

e) The maximum value of torque angle a in a synchronous motor is ..... degrees electrical.
(i) 45 (ii) 90
(iii) between 45 and 90 (iv) below 60

f) The main thing common between Hopkinson's test and Field's test is that both
(i) requires two electrically-coupled series motors
(ii) need two similar mechanically-coupled motors
(iii) use negligible power
(iv) are regenerative tests

g) At leading p.f. the armatures flux in an alternator _____ the rotor flux.
(i) opposes (ii) distorts
(iii) aids (iv) does not affect

h) When load on a synchronous motor is increased its armature current is increased provided it is
(i) normally excited (ii) over excited
(iii) under excited (iv) all of the above

i) Which alternator are more suitable for high-speed system?
(i) salient pole (ii) non – salient pole
(iii) both (i) and (ii) (iv) none of these

j) Define: Hunting.

k) An unexcited single phase synchronous motor is
(i) AC series motor (ii) universal motor
(iii) reluctance motor (iv) repulsion motor

l) In synchronous motor inverted V curve represents the relation between
(i) field current and power factor (ii) field current and armature current
(iii) armature current and power factor (iv) none of these

m) One of the basic requirements of a servomotor is that it must produce high torque at all
(i) loads (ii) frequencies
(iii) speeds (iv) voltages

n) A switched relunctance motor differs from a VR stepper motor in the sense that it
(i) has rotor poles of ferromagnetic material
(ii) rotates continuously
(iii) is designed for open-loop operation only
(iv) has lower efficiency

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

(a) Explain Hopkinson's test for determination of efficiency of DC shunt machine.

(b) Explain Armature reaction and its effects at different power factor in Alternator.

Q-3 **Attempt all questions** **(14)**

(a) Explain the operation of A.C. servo motor.

(b) What are the different types of torques in synchronous motor? Explain each of them.

Q-4 **Attempt all questions** **(14)**

(a) Explain the slip test for measurement of Xd and Xq of synchronous machines.

(b) A 3300 V, delta – connected motor has a synchronous motor has a synchronous reactance per phase (delta) of 18Ω. It operates at a leading power factor of 0.707 when drawing 800 kW from the mains. Calculate its excitation emf.

Q-5 **Attempt all questions** **(14)**

(a) Explain construction and working of variable reluctance stepper motor.

(b) Describe the experimental setup to obtain the V-curves of a synchronous motor.

Q-6 **Attempt all questions** **(14)**

(a) Explain single phase synchronous generator.

(b) A 400 V, 50 Hz, 3-phase, 37.5 KW, star connected synchonous motor has a full-load efficiency of 88%. The synchronous impedance of the motor is (0.2+j1.6) ohm per phase. If the excitation of the motor is adjusted to give a leading pf of 0.9, Calculate for full-load (a) the induced emf (b) total mechanical power

developed.

Q-7 **Attempt all questions** **(14)**

(a) Write a note on Permanent Magnet Brush Less DC motor.

(b) Draw and explain the capability curve of a synchronous generator.

Q-8 **Attempt all questions** **(14)**

(a) Explain construction & working of Hysteresis motor.

(b) Explain construction and working of an induction regulator.