Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name: Electrical Machine Design – II

Subject Code: 4TE08EMD1 Branch: B.Tech (Electrical)

Semester: 8 Date: 15/04/2019 Time: 10:30 To 01:30 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) Define the term : total magnetic loading

b) Define the term : specific electrical loading

c) The value of slip at full load is determined by the
(A) rotor resistance (B) stator resistance
(C) slip (D) none of the above

d) In a capacitor start motor, the phase displacement between starting and running winding can be nearly
(A) 90° (B) 0°
(C) 30° (D) 60°

e) Basically induction machine was invented by
(A) Thomas Alva Edison (B) Fleming
(C) Nikola Tesla (D) Michel Faraday

f) The power factor of a single-phase induction motor is usually
(A) unity (B) lagging
(C) always leading (D) unity to 0.8 leading

g) The frame of an induction motor generally made up of
(A) silicon steel (B) aluminum
(C) bronze (D) cast iron

h) Short circuit ratio for turbo-alternators is usually
(A) 0.1 to 0.2 (B) 0.2 to 0.4
(C) 0.5 to 0.7 (D) 0.8 to 0.95

i) The maximum speed variation in a 3-phase synchronous motor is
(A)10% (B) 6%
(C) 4% (D) 0%

j) A three phase 440 V, 50 Hz induction motor has 4% slip. The frequency of rotor emf will be
(A) 200 Hz (B) 50 Hz
(C) 2 Hz (D) 0.2 Hz

k) The minimum value of number of slots per pole per phase (q) is
(A) 0 (B) 1

(C) 4 (D) 2

l) The ratio of core length to pole pitch for good efficiency is
(A) 0 (B) 0.5
(C) 1.5 (D) 1

m) The shaft of an induction motor is made up of
(A)high speed steel (B) stainless steel
(C) carbon steel (D) cast iron

n) In synchronous motor the torque is proportional to
(A)Power P (B) 1/P
(C) P^2 (D) $1/P^2$

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

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

(a) What is computer aided design? Explain advantages and limitation of computer aided design of machines. **(07)**

(b) Which factors should be considered when estimating the length of the air-gap of the induction motor? Why the air-gap should be as small as possible? **(07)**

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

(a) Derive the output equation for ac machine. **(07)**

(b) Explain design of rotor bars and slots of three phase induction motor. **(07)**

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

(a) Explain design of starting winding for split phase motors. **(07)**

(b) Find the main dimensions of a 15 kW, 3 phase, 400 V, 50 Hz, 2810 r.p.m. squirrel cage induction motor having an efficiency of 0.88 and a full load power factor of 0.9. Assume: Specific magnetic loading = 0.5 $Wb/m^{2;}$ specific electric loading = 25000 A/m. Take the rotor peripheral speed as approximately 20 m/s at synchronous speed. **(07)**

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

(a) What is Short circuit ratio? Explain effect of SCR on synchronous machine performance. **(07)**

(b) A 3 phase, 2 pole, 50 Hz squirrel cage induction motor has a rotor diameter 0.20 m and core length 0.12 m. The peak density in the air gap is 0.55 Wb/m^2. The rotor has 33 bars, each of resistance 125μΩ and a leakage inductance is 2μH. The slip is 6%. Calculate (i) the peak value of current in each bar (ii) rotor I^2R loss (iii) rotor output and (iv) torque exerted. Neglect the resistance of end rings. **(07)**

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

(a) Explain design of damper winding. **(07)**

(b) Find the main dimensions of a 2500 kVA, 187.5 r.p.m., 50 Hz, 3 phase, 3 kV, salient pole synchronous generator. The generator is to be a vertical, water wheel type. The specific magnetic loading is 0.6 Wb/m^2 and the specific electric loading is 34000 A/m. Use circular poles with ratio of core length to pole pitch = 0.65. Specify the type of pole construction used if the run-away speed is about 2 times the normal speed. **(07)**

Q-7		**Attempt all questions**	**(14)**
	(a)	State some methods to reduce the harmonic torque in induction motor.	**(07)**
	(b)	Explain flow chart for finding main dimensions of induction motor.	**(07)**
Q-8		**Attempt all questions**	**(14)**
	(a)	Explain design of rotor and height of pole for synchronous machines.	**(07)**
	(b)	Explain elimination of harmonics in synchronous machines.	**(07)**