

Enrollment No:-_____

Exam Seat No:-_____

C.U.SHAH UNIVERSITY

Summer-2015

Subject Code: 4TE03EME1

Subject Name: Electrical Machine

Course Name: B.Tech (IC)

Date: 8/5/2015

Semester: III

Marks : 70

Time: 02:30 TO 05:30

Instructions:

- 1) Attempt all Questions of both sections in same answer book/Supplementary.
- 2) Use of Programmable calculator & any other electronic instrument prohibited.
- 3) Instructions written on main answer book are strictly to be obeyed.
- 4) Draw neat diagrams & figures (if necessary) at right places.
- 5) Assume suitable & perfect data if needed.

SECTION-I

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| Q-1 | 07 |
| (A) What is the function of Communicator in D.C. machines? | 02 |
| (B) Why do we require starter in D.C. machines? | 02 |
| (C) Write applications of D.C. compound motors. | 01 |
| (D) Define the terms: Front pitch and back pitch | 02 |

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| Q-2 | 14 |
| (A) Derive and explain the condition for maximum efficiency in D.C. generator with the help of neat sketch. | 04 |
| (B) Explain and draw sketch of the Three point starter of D.C. Motor. | 05 |
| (C) A Long shunt compound generator delivers a load current of 70A at 500V and has armature, Series field and Shunt field resistances of 0.05 ohm, 0.03 ohm and 300 ohm respectively. Calculate the generated voltage and armature current. Allow 1 V Per brush for contact drop. | 05 |

OR

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| Q-2 | 14 |
| (A) Explain the losses in D.C. Machine with the help of diagram. | 04 |
| (B) (i). Explain the armature demagnetizes or weakens of the main flux. | 06 |
| (ii) Explain the armature cross magnetizes. | |
| (C) One shunt motor has armature resistance of 0.2 ohm and field resistance of 110 ohm 220V. The motor draw 5A at 1500 r.p.m. at load. Calculate the speed and shaft torque if the motor draws 52 A at rated voltage. | 04 |



- Q-3 14
 (A) Explain the performance of D.C. Series and Shunt Motor with help of neat sketch. 07
 (B) Derive and explain the E.M.F equation and the circuit diagram of single phase Transformer. 07

OR

- Q-3 14
 (A) Explain the Open circuit and Short circuit test of Transformer. 07
 (B) A single phase transformer has 500 turns on the primary and 40 turns on the secondary winding. The mean length of the magnetic path in iron core is 150cm and the joints are equivalent to air-gap of 0.1mm. When a p.d of 3000V is applied to the primary, maximum flux density is 1.2Wb/m^2 . Calculate (a). The cross-sectional area of the core (b) no-load Voltage and Current primary side, secondary side. (c). Power factor on no-load. Given that AT/cm for flux density of 1.2Wb/m^2 in iron to be 5, the corresponding iron loss to be 2watt/kg at 50 Hz and the density of iron as 7.8gram/cm^3 07

SECTION-II

- Q-4 07
 (A) Draw the equivalent circuit of three phase induction motor. 02
 (B) Write merits and demerits of single phase induction motor. 02
 (C) Explain the slip in induction motor. 01
 (D) Write the relation between torque and rotor power factor. 02

- Q-5 14
 (A) Explain the condition of parallel operation of three phase transformer. 05
 (B) Explain how rotating magnetic field is produced in 3-phase induction motor? 05
 (C) A 4-pole, 3-phase induction motor operates from a supply whose frequency is 50 Hz. Calculate: 04
 (i) The speed at which the magnetic field of the stator is rotating
 (ii) The speed of the rotor when the slip is 0.04.
 (iii) The frequency of the rotor currents when the slip is 0.03.
 (iv) The frequency of the rotor currents at standstill

OR

- Q-5 14
 (A) Explain how three phase supply can be converted into two phase supply using Scott connection? 05
 (B) Write a principle, applications, merits and de-merits of auto transformer. 05
 (C) A 3 phase, 415 V, star-connected induction motor has a star-connected rotor with a stator to rotor turn ratio of 8.5. The rotor resistance and standstill reactance per phase are 0.05 ohm and 0.25 ohm respectively. What should be the value of external resistance per phase to be inserted in the rotor circuit to obtain maximum torque at starting and what will be rotor starting current with 04



this resistance?

- Q-6 14
- (A) A 120 kVA, 6000/400 V, Y/Y, 3-phase, 50 Hz transformer has an iron loss of 1600 W. The maximum efficiency occurs at 3/4 full load. Find the efficiencies of the transformer at (i) full-load and 0.8 power factor (ii) half load and unity power factor (iii) the maximum efficiency. 07
- (B) Explain the Torque/Speed curve Characteristics of Induction Motor with sketch. 07

OR

- Q-6 14
- (A) A 750 kW, 3-phase, 50-Hz, 16-pole induction motor has a rotor impedance of $(0.02 + j 0.15) \Omega$ at standstill. Full-load torque is obtained at 360 rpm. Calculate (i) the ratio of maximum to full-load torque (ii) the speed of maximum torque and (iii) the rotor resistance to be added to get maximum starting torque. 07
- (B) Explain the power balance equation and Maximum power output equation for single phase induction motor. 07

