

Subject Name : Advance Electrical Machine**Subject Code : 4TE04AEM1 Branch : Electrical Electronics Engineering****Semester : 4 Date : 23 / 11 / 2015 Time : 2.30 To 5.30 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)**

(MCQ/Short Type of Questions=1 mark*14=14 marks)

- a) An electro-mechanical energy conversion device is one which converts _____ (01)
- a) Electrical energy to mechanical energy only
 - b) Mechanical energy to electrical energy only
 - c) All of the mentioned
 - d) None of the mentioned
- b) The slip of an induction motor normally does not depend on (01)
- a) rotor speed, b) synchronous speed, c) shaft torque, d) core-loss component
- c) The locked rotor current in a 3-phase, star connected 15 , kW 4 , pole 230 V, 50 Hz induction motor at rated conditions is 50 A. Neglecting losses and magnetizing current, the approximate locked rotor line current drawn when the motor is connected to a 236 , V 57 Hz supply is (01)
- a) 58.5 A, b) 45.0 A, c) 42.7 A, d) 55.6 A
- d) A 4 point starter is used to start and control the speed of a (01)
- a) dc shunt motor with armature resistance control
 - b) dc shunt motor with field weakening control
 - c) dc series motor
 - d) dc compound motor
- e) A three phase, salient pole synchronous motor is connected to an infinite bus. It is operated at no load a normal excitation. The field excitation of the motor is first reduced to zero and then increased in reverse direction gradually. Then the armature current. (01)
- a) Increases continuously
 - b) First increases and then decreases steeply
 - c) First decreases and then increases steeply
 - d) Remains constant
- f) A three-phase 440 V, 6 pole, 50 Hz, squirrel cage induction motor is running at a slip of 5%. The speed of stator magnetic field to rotor magnetic field and speed of rotor with respect of stator magnetic field are (01)
- a) zero, -5 rpm
 - b) zero, 955 rpm



- c) 1000 rpm, -5 rpm
d) 1000 rpm, 955 rpm
- g) If the wave form of $i(t)$ is changed to $i(t) = 10 \sin \pi t$ A, the peak voltage across A and B with S closed is (01)
a) 400 V, b) 240 V, c) 320 V, d) 160 V
- h) A 230 V, 50 Hz, 4-pole, single-phase induction motor is rotating in the clockwise (forward) direction at a speed of 1425 rpm. If the rotor resistance at standstill is 7.8Ω , then the effective rotor resistance in the backward branch of the equivalent circuit will be (01)
a) 2Ω , b) 4Ω , c) 78Ω , d) 156Ω
- i) The speed of rotation of stator magnetic field with respect to rotor structure will be (01)
a) 90 rpm in the direction of rotation
b) 90 rpm in the opposite direction of rotation
c) 1500 rpm in the direction of rotation
d) 1500 rpm in the opposite direction of rotation
- j) What is an air-gap line in alternator? (01)
a). Tangent to OCC is called air-gap line
b). similar to OCC is called air-gap line
c). inverse parallel to OCC is called air-gap line
d). none of the above
- k) What is the maximum speed of a 50Hz alternator? (01)
a). 14000 rpm, b). 3000 rpm, c). 6000 rpm, d) 12000 rpm.
- l) Calculate the pitch factor of the following winding: 36 stator slot, 4 pole, coil span 1-8, (01)
a). 0.9848, b). 0.09848, c). 0.9848, d) 0.0098
- m) The inductive reactance of a transformer depends on (01)
a). electro motive force
b). magneto motive force
c). magnetic flux
d). leakage flux.
- n) The number of slip-rings in a rotating field system type alternator is (01)
a). 02, b). 03, c). 04, d). 06

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

- Q-2 Attempt all questions (14)**
- a) Explain the constructional details of a 3-phase transformer, with diagrams. (05)
b) Give the merits and demerits of delta/ star connected three phase transformer. (05)
c) Explain Sumpner's test with help of sketch. (04)
- Q-3 Attempt all questions (14)**
- a) What is the most commonly used 3-phase induction motor? Justify its. (06)
b) Derive an expression of rotor frequency in terms of main supply frequency and slip. (05)



- c) Explain the construction and working of poly phase induction motor. (03)
- Q-4** **Attempt all questions** (14)
- a) Explain with proper phasor diagram of the operation of a synchronous motor. (07)
- b) Describe the V curve for synchronous motor. (04)
- c) Write a short note of the characteristics of alternator (03)
- Q-5** **Attempt all questions** (14)
- a) Draw the circle diagram from no-load and short-circuit test of a 3-phase, 19 kW, 415 V, 6-pole induction motor from following test results(line values) (07)
 No-load : 415 V, 11 A, p.f.= 0.3
 Short circuit : 110V, 25 A, p.f.= 0.6
 Rotor cu loss at standstill is same as stator cu loss. From the circle diagram, find
 (i) line current, slip, efficiency and p.f. at full load (ii) the maximum torque
- b) A 110 V, 50 Hz, 1hp universal motor runs at 6000 rpm and takes 0.6 amp when connected to a 110 V dc source. Determine speed, toque and power factor of the motor, when it is connected to a 110V, 50 Hz supply, and is loaded to take 0.6 amp(rms). The resistance and inductance measured at terminals of the machine are 20 ohm and 0.25 H respectively. (07)
- Q-6** **Attempt all questions** (14)
- a) Explain the construction and working principle of Repulsion motor. (05)
- b) Describe the working of brushless DC motor. (05)
- c) Explain the Unbalanced Operation of Poly phase Induction Motor (04)
- Q-7** **Attempt all questions** (14)
- a) Draw the Connection Three phase transformer (Dd0, Yy0, Dy1, Yd11, Yy6) (07)
- b) Explain the brief the Conditions of Parallel operation of synchronous generator. (07)
- Q-8** **Attempt all questions** (14)
- a) Explain the power flow diagram for poly phase induction motor. (06)
- b) Write short notes of following terms (08)
- Split Phase Motors,
 - Capacitor Type Motor,
 - Shaded Pole Induction Motor
 - Self-Starting Synchronous Motor.

