

22523

12223

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : 10
- a) Define synchronous speed. Write the relationship between N_s and N_r , where symbols have their usual meaning.
 - b) Draw diagram of Resistance start induction run Single Phase Induction Motor.
 - c) Compare salient Rotor and cylindrical Rotor for alternator.
 - d) Define chording factor and distribution factor for alternator winding.
 - e) Define –
 - (i) Pull in Torque
 - (ii) Pull out Torque in case of synchronous motor
 - f) State any four applications of BLDC Motor.
 - g) Draw the torque speed characteristics of A.C. Servo motor.

P.T.O.

- 2. Attempt any THREE of the following :** **12**
- a) State any four advantages of squirrel cage induction motor over slip ring induction motor.
 - b) Explain production of Rotating Magnetic field in case of 3 phase Induction motor using vectors.
 - c) Explain working of synchronous motor. Explain any one method of starting.
 - d) Explain the effect of armature Reaction on main field flux of alternator with load of –
 - (i) unity pf
 - (ii) Zero pf leading
- 3. Attempt any THREE of the following :** **12**
- a) Draw and explain Torque Slip characteristic of 3 phase Induction motor.
 - b) A 4 pole, 3 phase Induction motor operates from a supply whose frequency is 50 Hz. Calculate :-
 - (i) Speed at which the magnetic field of the stator is rotating.
 - (ii) Speed of the Rotor when slip is 0.04.
 - (iii) Frequency of the Rotor current when the slip is 0.03.
 - (iv) Frequency of the rotor currents at standstill.
 - c) Explain with neat sketches working of Hysteresis motor.
 - d) Derive the EMF equation of Alternator. State the meaning of each term and therein.
- 4. Attempt any THREE of the following :** **12**
- a) The power input to the rotor of a 400V, 50Hz, 6 pole, 3 ϕ Induction motor is 75 KW. The rotor electromotive force is observed to make 100 complete alteration per minute. Calculate
 - (i) Slip
 - (ii) Rotor speed
 - (iii) Rotor Copper Loss per phase
 - (iv) Mechanical Power developed

- b) Explain why single phase Induction Motor not self starting with the help of double field Revolving Theory.
- c) Explain working of capacitor start Induction run single phase Induction motor. Draw Phasor diagram.
- d) Explain construction and working of Synchronous Reluctance motor.
- e) Explain the construction of PMSM motor. Also draw the Torque speed characteristic of this motor.

5. Attempt any TWO of the following : **12**

- a) Explain with neat sketch the operation of Auto Transformer starter for 3ϕ induction motor.
- b) Draw and explain torque speed characteristics of Universal motor and state applications of the same.
- c) i) Define – 2
 - (1) Synchronous Reactance
 - (2) Synchronous Impedance
- ii) From the following test results, determine the Voltage Regulation of a 2000V, 1- ϕ alternator, delivering a current of 100A at 4
 - (1) Unity pf
 - (2) 0.8 leading pf.

Test Results : Full load current of 100A is produced on short circuit by a field excitation of 2.5A.

An emf of 500V is produced on open circuit by the same excitation. The armature resistance is 0.8Ω .

6. Attempt any TWO of the following :**12**

- a) Explain the concept of Hunting and phase swinging in synchronous motor.
- b) Draw and explain V and inverted V curves of synchronous motor.

- c) (i) Explain in brief the effect of Harmonics on Pitch and Distribution factor

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- (ii) A 3 phase, 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 Wb, Sinusoidally distributed and the speed is 375 rpm. Find

- (1) Frequency rpm

- (2) Phase Emf

- (3) Line emf

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Assume full pitched coil.
