

315333

25226

3 Hours / 70 Marks

Seat No.

--	--	--	--	--	--	--	--

- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answer with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) 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) State any two factors affecting the slip of 3ϕ Induction motor.
 - b) Write the equation of rotor power factor at standstill and under running condition.
 - c) State any two advantages of soft starter over a conventional starter.
 - d) Draw a torque speed characteristics of shaded pole, motor.
 - e) Define:
 - i) Pull-in torque
 - ii) Pull-out torque, in case of synchronous motor.
 - f) State the factors affecting the voltage regulation of alternator.
 - g) List the applications of stepper motor.

P.T.O.

2. Attempt any THREE of the following: 12

- a) Describe the working of star delta starter with neat sketch.
- b) Draw a block diagram of a variable frequency drive and explain the function of each block.
- c) A three phase delta connected cage type induction motor when connected directly to 400V, 50Hz supply takes a starting current of 100A in each stator phase. Calculate:
 - i) The line current for Direct online starting.
 - ii) Line and phase starting currents for star-delta starting.
 - iii) Line and phase starting currents for a 70 percent tapping on auto transformer starting.
- d) Explain with neat sketch the construction of capacitor start induction run single phase induction motor.

3. Attempt any THREE of the following: 12

- a) Explain with neat sketch double field revolving theory in single phase induction motor.
- b) Explain shaded pole self starting technique used in single phase induction motor.
- c) Describe with neat sketch the working of capacitor start capacitor run (two value) single phase induction motor.
- d) A single phase induction motor has stator winding is space quadrature and is supplied with a single phase voltage of 200 V at 50 Hz. The standstill impedance of the main winding is $(5.2 + j10.1) \Omega$ and of the auxiliary winding is $(19.7 + j14.2) \Omega$. Find the value of capacitance to be inserted in the auxiliary winding for maximum starting torque.

4. Attempt any THREE of the following: 12

- a) Describe a stepwise procedure of stroboscopic method used for slip measurement in three phase induction motor.
- b) Draw and explain Torque slip characteristics of three phase induction motor.
- c) Explain with neat sketch the construction of synchronous reluctance motor.

- d) Compare single sided linear induction motor with double sided linear induction motor on the basis of:
- i) Construction of primary winding
 - ii) Magnetic flux path
 - iii) Efficiency
 - iv) Power factor.
- e) A single-stack, eight phase (stator) multipole stepper motor has six rotor teeth. The phases are excited one at a time. Determine:
- i) Step size
 - ii) steps per revolution
 - iii) speed if the excitation frequency is 120 Hz.

5. Attempt any TWO of the following:

12

- a) i) Derive E.M.F. equation of three phase alternator.
- ii) A star connected 3 phase, 6 pole alternator runs at 1200 rpm, having flux per pole of 0.1 Wb sinusoidally distributed. Its stator has 54 slots having double layer winding. Each coil has 8 turns and the coil is chorded by 1 slot. Calculate the no load phase and line voltage.
- b) Illustrate the production of rotating magnetic field in three phase induction motor using suitable phasor diagram.
- c) What is armature reaction in an alternator. Explain the effect of armature reaction at various p.f. of loads of Alternator.

6. Attempt any TWO of the following:

12

- a) i) Derive the equation for the ratio of full load torque to maximum torque in three phase induction motor.
- ii) A 50 Hz, 8 pole I. M. has full load slip of 4%, The rotor resistance/ph and standstill reactance/ph is 0.01Ω and 0.01Ω respectively. Find ratio of maximum to full load torque and also calculate speed at maximum torque.

- b) A 2000 V, 1 phase alternator delivering a current of 100 A giving a following test results.

Full load current of 100 A is produced on short circuit by a field excitation of 2.5 A. An e.m.f. of 500 V is produced on open circuit by the same excitation. The armature resistance is 0.8Ω . Determine Voltage regulation at:

- i) unity p.f.
 - ii) 0.8 p.f. leading
 - iii) 0.>1 p.f. lagging.
- c) i) Draw and label different power stages in three phase induction motor.
- ii) The power input to the rotor of induction motor is 80 Kw. The rotor e.m.f. is observed to make 100 complete alterations per minute. Calculate:
- a) slip
 - b) The rotor speed
 - c) Rotor copper losses/ph.
-