12526
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 answers 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) Define slip and synchronous speed of 3ϕ Induction Motor.
b) State the function of following parts in Induction Motor stator and rotor.
c) State any four application of shaded pole induction motor.
d) List the types of single phase Induction Motor.
e) Define pitch factor and distribution factor.
f) List different types torques in synchronous motor.
g) List application of stepper motor.

2. Attempt any THREE of the following : **12**

a) Explain working of the soft starter with neat diagram.
b) Draw neat diagram of Star-Delta starter for 3-ϕ Induction motor.
c) State the necessity of starter for 3-ϕ induction motor and list types of starter.
d) Explain with neat diagram, working of capacitor start capacitor run induction motor.

3. Attempt any THREE of the following : **12**

a) Explain working of resistance split phase 1ϕ Induction motor with vector diagram.
b) Explain double field revolving theory of single phase Induction motor.
c) Compare between capacitor start and capacitor start capacitor run induction motor.
d) Suggest type of Single Phase Induction motor suitable for the following applications.
   i) Washing machine
   ii) Refrigerator
   iii) Petrol pumps
   iv) Recording Instruments

4. Attempt any THREE of the following : **12**

a) Explain the concept of Rotating Magnetic field in 3-Phase Induction Motor.
b) The power input to a 6 pole, 3 phase, 50 Hz induction motor is 42 KW, the speed being 970 rpm. The stator Losses are 1.2 KW and friction and windage losses are 1.8 KW. Find
   i) Slip
   ii) Rotor output
   iii) Rotor copper loss
   iv) Efficiency

c) Explain the construction and working of permanent magnet stepper motor.
d) Explain the construction of universal motor and draw its torque-speed characteristics.
e) Draw and explain working of Resistance Split Phase single phase induction motor. Also draw its Torque-Speed characteristics.

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

a) A 3-phase, star connected alternator rated at 1600 kVA, 13500 V; The armature resistance and synchronous reactance are 1.5 Ω and 30 Ω respectively per phase - calculate percentage voltage regulation for a load of 1280 kW at a power factor:
   i) 0.8 leading
   ii) Unity
b) A 12 pole 50 Hz, 3 phase Induction motor has rotor resistance of 0.15 Ω and stand still reactance of 0.25 Ω per phase. On full load, it is running at a speed of 480 rpm. The rotor induced emf per phase at standstill is obeserved to be 32V. Calculate
   i) Starting torque
   ii) Full load torque
   iii) Maximum Torque
c) Explain in details the power stages in induction motor. (power flow diagram)

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

a) List out various methods of measurement of slip. Describe how slip is measured by each method.
b) A 3 phase, 50 Hz, 8 pole alternator has start connected winding with 120 slots and 8 conductors per slot. The flux per pole is 0.05 wb, sinusoidally distributed. Determine the phase and line voltages assume full pitch coil.
c) Explain in details armature reaction at various power factors of the load on an alternator. Draw suitable waveforms showing the effects of armature flux.