22523

22223

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

(6) Preferably, write the answers in sequential order

Marks

1. Attempt any FIVE of the following: **10**

a) State the reasons of skewed rotor bars in 3 ϕ squirrel cage I.M.

b) State any four applications of hysteresis motor.

c) State why distributed windings are preferred over concentrated winding in alternator.

d) List four advantages of having a stationary armature and rotating field of 3-phase alternator.

e) State any two functions of damper winding in a synchronous motor.

f) Draw Torque-speed characteristics of BLDC motor.

g) Define step angle and write its equation in case of stepper motor.

Marks

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

a) Compare squirrel cage I.M. and phase wound I.M. with reference to construction speed control, maintenance and applications.

b) Derive the torque equation of 3 ϕ I.M. under running condition.

c) State the factors affecting terminal voltage of an alternator and describe their effect on terminal voltage.

d) State why synchronous motor is not self-starting. List the methods generally used to start synchronous motor.

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

a) Explain production of R.M.F. in 3-phase I.M. when 3 ϕ supply is fed to it. Draw its phasor diagram.

b) Draw the approximate equivalent circuit diagram along with its vector diagram of 3 ϕ I.M.

c) Suggest type of 1 ϕ Induction motor suitable for the following applications.

i) Washing machine

ii) Refrigerater

iii) Petrol pumps

iv) Sewing machine

d) Open circuit test and short circuit test were carried out on a 3 ϕ alternator. It was found that at a field current of 10A, it produces a current of 200 A on short circuit and developed 1150 V on open circuit. The effective resistance of phase winding is 0.6 Ω. The alternator is star connected. Determine synchronous impedance / ph and synchronous reactance / ph.

Marks

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

a) Power input to a 400 V, 60 Hz, 6 pole 3 ϕ I.M. running at 1140 rpm. is 40 Kw. at 0.8 p.f. lag. Stator losses are 1000 W. and friction windage losses are 2000 W. Calculate -

i) Slip

ii) Rotor copper loss

iii) Shaft power

iv) efficiency

b) Explain the reason why single phase induction motor is not self starting how to make it self starting.

c) Explain construction and working of two value capacitor start and run. 1 ϕ induction motor with neat suitable diagram.

d) Draw and explain dynamic characteristics of stepper motor.

e) Describe the working of switched reluctance motor with suitable diagram.

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

a) A 3 ϕ I.M. has synchronous speed of 250 rpm and 4% slip at full load. The rotor has a resistance of 0.02 Ω/ph and stand still reactance of 0.15 Ω/ph. Calculate

i) The speed at which max torque is developed.

ii) The ratio of maximum to F. L. torque.

iii) The ratio of maximum to starting torque.

iv) What value of resistance/ph have so that the starting torque is half the max torque.

b) Describe the construction, working of shaded pole I.M. with neat diagram.

c) A 3 ϕ, 50 Hz, λ connected 200 KVA, 2300 V alternator gives S.C. current of 60 A for certain field excitation on. With same excitation O.C. voltage/ph is 900 V. The armature resistance is 1.2 Ω/ph, find F.L. regulation at

i) U.p.f

ii) 0.8 p.f lagging.

Marks

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

a) Explain with suitable diagram the phenomenon of hunting. State causes and effect of hunting in 3ϕ synchronous motor.

b) Compare salient pole rotor with smooth cylindrical rotor of 3ϕ alternator (any six points)

c) A 400 V, 50 Hz, 3ϕ, 37.5 Kw, λ connected synchronous motor has a F. L. efficiency of 85%. The synchronous impedance of the motor is $(0.2+j1.6)\Omega$/ph. If the excitation of motor is adjusted to give a leading power factor of 0.9. Calculate the following for full load.

i) The excitation e.m.f.

ii) The total mechanical power developed.

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