

22523

24225

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 answer 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) State the reasons of skewed rotor bars in 3 ϕ squirrel cage I.M.
 - b) Define rotor frequency and slip of three phase induction motor.
 - c) Draw diagram of capacitor start single phase induction motor.
 - d) Compare salient pole rotor and cylindrical rotor for alternator.
(Any two points)
 - e) Calculate the distribution factor for 36 slots, 4 pole single layer three phase winding.
 - f) Draw schematic diagram of AC servo motor.
 - g) List application of stepper motor.

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- 2. Attempt any THREE of the following:** **12**
- a) List the speed control method of 3ϕ phase Induction Motor.
 - b) Describe with neat sketch the principal of operation of single phase shaded pole induction motor.
 - c) Explain factor affecting the terminal voltage of alternator in armature resistance and voltage leakage drops.
 - d) “The synchronous motor is not self starting”. Justify.
- 3. Attempt any THREE of the following:** **12**
- a) Explain production of Rotating Magnetic field in case of 3 phase Induction Motor using vector diagrams.
 - b) Suggest type of 1ϕ (single phase) Induction Motor suitable for the following applications –
 - i) Washing machine
 - ii) Refrigerator
 - iii) Petrol pumps
 - iv) Sewing machine.
 - c) Explain the principal of operation of 3ϕ (phase) Synchronous motor.
 - d) Explain working principal of BLDC motor with neat sketch.
- 4. Attempt any THREE of the following:** **12**
- a) Derive the torque equation of 3ϕ I.M. under running condition.
 - b) Compare resistance split phase motor with capacitor split phase motor on the basis of –
 - i) Output
 - ii) Starting torque
 - iii) Power factor
 - iv) Applications.
 - c) Define the following terms and write their mathematical expression –
 - i) Pitch factor
 - ii) Distribution factor related to the winding of alternator.
 - d) Explain with suitable diagram the phenomenon of hunting. State effect of hunting on 3ϕ synchronous motor.

- e) Draw and explain torque speed characteristics of Universal Motor.

5. Attempt any TWO of the following: 12

- a) State why three phase induction motor need starter? List types of starter. Explain any one starter.
- b) Explain construction, working and applications of capacitor start and capacitor run single phase induction motor with neat suitable diagram.
- c) 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.
- The speed of which maximum torque is developed.
 - The ratio of maximum to F.L. torque.
 - The ratio of maximum to starting torque.
 - What value of resistance/ph have so that the starting torque is half the max torque.

6. Attempt any TWO of the following: 12

- a) Describe the factors affecting the regulation of 3 ϕ alternator and draw the phasor diagram of loaded alternator when operating power factor is lagging and leading.
- b) Define voltage regulation of alternator. A 400V, 20kVA, 3 phase star connected alternator has resistance per phase of 2.0 ohm. Open circuit voltage per phase of 90 volt is obtained for field current of 1.5 A for same field current. Short circuit current per phase is 20A
- Calculate –
- Synchronous impedance
 - Synchronous reactance
 - Open circuit voltage/phase
 - Regulation while supply a load current of 20A at 0.7 power factor lagging.
- c) Draw and explain V and inverted V curve of synchronous motor.
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