

22523

23124

3 Hours / 70 Marks

Seat No.

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- 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) Use of Non-programmable Electronic Pocket Calculator is permissible.
- (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 Rotor frequency and slip of three phase induction motor.
 - b) State any two applications of Hysteresis motor.
 - c) State working principle of induction motor.
 - d) Define short pitch factor and distribution factor.
 - e) State methods of starting of synchronous motor.
 - f) List any four applications of BLDC motor.
 - g) Define synchronous reactance and synchronous impedance.

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- 2. Attempt any THREE of the following:** **12**
- a) List the speed control methods of three phase induction motor and explain any one method.
 - b) Draw with neat diagram of shaded pole motor.
 - c) Derive EMF equation of alternator. State the meaning of each term used in it.
 - d) Explain motor selection for different application as per load speed characteristics.
- 3. Attempt any THREE of the following:** **12**
- a) Compare slip ring induction motor with squirrel cage induction motor on any four points.
 - b) Explain construction and working of hysteresis 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.
- 4. Attempt any THREE of the following:** **12**
- a) A three phase, 50 Hz, 6 pole alternator has star connected winding with 120 slots 6 conductor per slot. The flux per pole is 0.04 wb, sinusoidally distributed. Determine the phase and line voltages.
 - b) Explain power flow diagram of 3 phase induction motor with neat sketch.
 - c) Draw and explain torque speed characteristics of Repulsion motor.
 - d) Explain armature reaction on various power factor and synchronous impedance. (unity p-f, zero p-f lagging, zero p-f leading)
 - e) Compare AC and DC servomotors.

5. Attempt any TWO of the following: 12

- a) Draw and explain V and inverted V curves of synchronous motor.
- b) A 3 phase, 4 pole 50 Hz, induction motor has rotor impedance of $(0.05 + j 0.16)\Omega$ / phase. Calculate speed of motor when delivery maximum voltage. Also calculate the resistance to be added to achieve 3/4th of maximum torque at time of starting.
- c) Draw and explain torque speed characteristics of universal motor and suggest the application of same.

6. Attempt any TWO of the following: 12

- a) Draw and explain with working of synchronous reluctance motor with help of neat diagram.
 - b) Define voltage regulation of alternator. A 400V, 20 kVA, 3 phase star connected alternator has resistance per phase of 2.0 Ohm. open circuit voltage per phase of 90 r is obtained for field current of 1.5 A for same field current, short circuit current per phase is 20A. Calculate –
 - i) Synchronous impedance
 - ii) Synchronous reactance
 - iii) Open circuit voltage/phase
 - iv) Regulation while supply a load current of 20 A at 0.7 power factor lagging.
 - c) Explain hunting in Synchronous motor state its causes and effects.
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