

17511

11920

3 Hours / 100 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: **20****
- a) Draw a block diagram showing power stages of 3 ϕ induction motor.
 - b) Compare squirrel cage and slip ring induction motor.
(any four points)
 - c) Draw a neat labelled sketch of autotransformer starter for starting of 3 ϕ I.M.
 - d) Derive the expression for distribution factor.
 - e) State the necessity of parallel operation of 3-phase alternator.
 - f) Give the reason why single phase induction motor are not self starting.
 - g) Explain the principle of operation of linear induction motor.

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- 2. Attempt any FOUR of the following:** **16**
- a) Derive the condition for maximum torque developed by IC for any value of slip(s) - 3ϕ I.M. under running condition.
 - b) Explain the necessity of starters in 3 phase induction motor.
 - c) Derive EMF equation of alternator.
 - d) Explain the concept of load sharing.
 - e) Explain working of shaded pole induction motor with suitable sketch.
 - f) Explain construction and working of permanent magnet stepper motor.
- 3. Attempt any FOUR of the following:** **16**
- a) Draw and explain the torque-slip characteristics of 3 phase I.M.
 - b) List the different method of speed control of 3ϕ I.M. and explain any one method in detail.
 - c) Compare salient pole type and smooth cylindrical type alternator. (Any four points)
 - d) State various method of synchronizing of 3-phase alternators. Explain any one method in detail.
 - e) Explain the construction and operation of resistance start induction run single phase induction motor with suitable diagram.
 - f) What is an universal motor? Comment briefly on its constructional features and speed torque characteristic. State any two application of this motor.

4. Attempt any FOUR of the following:**16**

- a) Explain the stroboscopic method for measurement of slip of 3ϕ I.M. with neat sketch.
- b) Draw a neat labeled sketch of star delta starter. Can we use star delta starter for starting a DC servo motor ?
- c) Explain the factors which affect the terminal voltage of alternator.
- d) Explain working of capacitor start capacitor run single phase induction motor.
- e) List any four types of $1-\phi$ induction motor. Write down any one application for each.
- f) What is Induction Generator? State its principle of operation and give any two application of it.

5. Attempt any TWO of the following:**16**

- a) A 4 pole, 3-phase, 50 Hz, 400 V induction motor develops an output of 55 KW at 1400 rpm. The mechanical torque lost is 2.5 N-m stator losses total to 314 watts. Calculate efficiency and current drawn at this output. Draw power flow diagram inserting values of this loading, power factor = 0.866.
- b) Explain the 'Synchronous Impedance' method of determining voltage regulation of an alternator.
- c) (i) Draw a schematic diagram of an A-C series motor.
(ii) Draw speed torque characteristics of A-C series motor.

6. Attempt any TWO of the following:**16**

- a) A 6 pole, 50 Hz, 3 phase induction motor running on full load with 3% slip develops a torque of 150 Nm at its pulley rim. The total mechanical losses are 550 W and stator losses are 1800 W.
- Calculate -
- (i) Output power
 - (ii) Rotor copper loss
 - (iii) Efficiency on full load
- b) A 3 ϕ , star connected, 100 KVA 11000 V alternator has rated current of 52.5 A. The a.c. resistance of the winding per phase is 0.45 Ω . The test results are given below
- O.C. test - field current = 12.5A voltage between lines = 422 V
- S.C. test - field current = 12.5A line current is equal to 52.5A
- Determine the full load voltage regulation of the alternator at p.f. 0.8 lagging and 0.8 p.f. leading.
- c) Describe armature reaction with flux distribution waveforms in a three phase alternator when the nature of load on the alternator is resistive, purely inductive and purely capacitive.
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