

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

MORNING

[Total No. of Questions: 09]

[Total No. of Pages: ...02..]

Uni. Roll No. ....

03 OCT 2023

Program: B.Tech. (Batch 2018 onward)

Semester: IV

Name of Subject: Electrical Machines -II (Asynchronous and Synchronous Machines)

Subject Code: PCIE-106

Paper ID: 16187

Scientific calculator is Allowed

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

- a) Illustrate the advantages of short pitch winding.
- b) Outline the need of parallel operation of alternators.
- c) Name two application of capacitor start motor.
- d) Construct V-curves for synchronous motor.
- e) Differentiate between salient pole and cylindrical rotors of synchronous machines.
- f) Evaluate winding factor for 36 slot, 4 pole, 3-phase winding. Winding is full pitched.

Part – B

[Marks: 04 each]

- Q2. Describe the crawling and cogging effect of three phase induction motor.
- Q3. Explain working principle, characteristics and applications of any one type of single-phase induction motor.
- Q4. Describe the effect of unequal voltages on parallel operation of alternators.
- Q5. Illustrate power angle characteristics of salient pole synchronous motor.

- Q6. Explain armature reaction. Explain the effect of armature reaction on the terminal voltage of alternator at zero leading pf.
- Q7. A 3-phase induction motor almost runs at 1000 rpm at no load and 950 rpm at full load when supplied with power from 50 Hz, 3-phase line. Calculate the percentage slip at full-load, frequency of rotor voltage, pole on the motor, speed of rotor field with respect to rotor.

## Part – C

[Marks: 12 each]

- Q8. (a) Using double field revolving theory explain why a single-phase induction motor is not self starting? (6 Marks)
- (b) Explain the operation and characteristics of double cage induction motor.(6 Mark)

OR

- (a) Describe the torque-slip characteristics of three-phase induction motor. (6 Marks)
- (b) A 746 kW, 16-pole, 3-phase, 50Hz induction motor has a rotor impedance  $(0.02 + j 0.15) \Omega$  at standstill. Full load torque is obtained at 360 rpm. Calculate (i) Speed of maximum torque (ii) ratio of maximum torque to full- load torque and (iii) the rotor resistance to be added to get maximum starting torque. (6 Marks)
- Q9. Explain the two synchronizing methods for alternators. Also analyse the change in speed of alternators.

OR

- (a) A star connected synchronous motor rated at 190 kV, 3-phase, 1900V, 67.5 A, 50 Hz, 187.5 rpm has an effective resistance 1.5 ohm and synchronous reactance of 20 ohm per phase. Find the internal power developed by the motor when it is operated at rated current and 0.8 pf leading. (6 Marks)
- (b) Explain in detail MMF and ZPF methods of voltage regulation. (6 Marks)

s\*\*\*\*\*