

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)  
B.Tech.Sem - IV ELECTRICAL : WINTER- 2022  
SUBJECT : SPECIAL PURPOSE MACHINES

Day : Thursday

Time : 02:30 PM-05:30 PM

Date : 24-11-2022

W-24548-2022

Max. Marks : 60

**N.B.**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non programmable **CALCULATOR** is allowed.
- 4) Draw neat and labeled diagrams **WHEREVER** necessary.
- 5) Assume suitable data **WHEREVER** necessary.

- Q.1** a) Describe the construction, working principle and applications of PCB motor. [05]  
b) Explain the working principle, characteristics and applications of universal motor. [05]

**OR**

- Q.1** Write short notes on: [10]  
a) Rosenberg generator b) Series Boosters

- Q.2** a) What are the features of DC servo motor? Why does servo motor have smaller diameter and more length? List two applications of DC servo motors. [06]  
b) Draw a schematic diagram of a single-phase ac servo motor and state its principle of working. [04]

**OR**

- Q.2** a) Draw and explain the torque-speed curves of an AC servomotor for various values of control voltages. [04]  
b) With relevant diagrams explain field-controlled DC Servomotors. [06]

- Q.3** a) Draw a schematic representation of variable reluctance-type stepper motor and explain its principle of working. [06]  
b) A stepper motor has a step angle of  $2.5^\circ$ . Determine: i) resolution ii) number of steps required for the shaft to make 25 revolutions and iii) Shaft speed, if the stepping frequency is 3600 rps. [04]

**OR**

- Q.3** a) With a neat sketch explain the principle of working of permanent magnet type stepper motor. [05]  
b) Explain the microprocessor-based control of stepper motor with the help of a block diagram. [05]

- Q.4** a) Explain performance characteristics and applications of synchronous reluctance motor. [05]  
b) Draw and explain the phasor diagram of synchronous reluctance motor. [05]

**OR**

- Q.4** a) Give the comparison between VR Stepper Motor and Switched Reluctance Motor. [05]  
b) Explain sensorless operation of SRM with neat diagram. [05]

- Q.5** a) Explain the construction and principle of operation of a dc brushless motor. [05]  
b) Derive the torque equation of PM BLDC motor. [05]

**OR**

- Q.5** a) What are the main advantages of BLDC motors? What are its drawbacks? List the application areas of BLDC motors. [05]  
b) How demagnetization occurs in PM BLDC motor? What are the ways by which demagnetization can be limited? [05]

- Q.6** Explain ideal and practical motor, armature MMF and synchronous reactance in PMSM. [10]

**OR**

- Q.6** a) Describe torque speed characteristics of PMSM. [05]  
b) Explain the principle of operation of permanent magnet synchronous motor. [05]

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