Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SET A

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2024

Semester : Semester V - 2021
Course Code : EEE3004
Course Name : Special Electrical Machines
Program : B.Tech.

Date : 05-JAN-2024
Time : 9:30AM - 12:30 PM
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **5 X 2M = 10M**

1. Explain the working principle of PM Stepper motor.

(CO1) [Knowledge]

2. State any 3 applications of stepper motors

(CO2) [Knowledge]

3. What are stepper motors?Classofy them based on working principle.

(CO3) [Knowledge]

4. Explain with a skecth unipolar and bipolar winding of stepper motor.

(CO4) [Knowledge]

5. Explain the dynamic characteristics of stepper motor.

(CO5) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **5 X 10M = 50M**

6. Stepper Motor is an electromechanical device which actuates a train of steps movements of shaft in response to train of input pulses. Formulate the construction & principle of a PM type stepper motor with different modes of excitation.

(CO1) [Comprehension]

7. Mr Virat want to build a drone project but he doesn't know which motor is suitable for this project. If he approaches you regarding the slection of motor criteria, then suggest the suitable motor and it's operation with neat sketch to him so that he will be able to select the motor.

(CO2) [Comprehension]

8. The open-loop control of the stepper motor cannot avoid the inherent disadvantages of the stepper motor itself, that is, resonance, oscillation, step loss and difficult to achieve high speed. State how the disadvantages can be eliminitated. Justify your answer with suitable explanation.

(CO3) [Comprehension]

9. An actuator is a device that produces a motion by converting energy and signals going into the system. The motion it produces can be either rotary or linear. Explain the construction and working principle of a motor which is used as actuators for door movement.

(CO4) [Comprehension]

10. The stepper motor is used for precise positioning with a motor, such as robotics, antennas, hard disk drives, telescopes, and some toys.With a block diagram and flow chart, explain the microprocessor-based control of stepper motor.

(CO3) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS **2 X 20M = 40M**

11. A 5kW, 4-pole, 230V, 50 Hz reluctance motor has a torque angle of 30o when running with rated load. Find the load torque. Find the torque angle if the voltage is decreased by 10V. Does the motor works with this torque angle?

(CO1) [Application]

12. A 3 phase, 4pole, 60 Hz, 230V star connected synchronous reluctance motor has direct axis and quadrature axis synchronous reactances of 22.5 Ω and 3.5 Ω respectively. The load torque of 12.5 Nm. The voltage to frequency ratio is maintained constant at rated value. Find (a) torque angle, (b) line current and (c) power factor. Neglect rotational losses and armature resistance.

(CO4) [Application]