

Register No.: ..... Name: .....

**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**FOURTH SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 2024****(2020 SCHEME)****Course Code : 20RBT292****Course Name: Sensors and Actuators for Robot****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. Define Proprioceptive sensors. Give 2 examples of its use in robots.
2. Write short note on Hall effect sensor.
3. Differentiate between contact and non-contact type sensors.
4. Explain proximity sensors and list the types of proximity sensors.
5. Interpret thresholding in vision system.
6. Define the term visual servoing.
7. Justify the term "Actuators are like the muscles of human arm".
8. Differentiate between stepper motor and a servomotor.
9. Explain the commonly used linear actuating mechanisms for robots.
10. State an application of rack & pinion linear actuator and brief its working principle.

**PART B*****(Answer one full question from each module, each question carries 14 marks)*****MODULE I**

11. a) Explain the working of a rotary absolute encoders used in robots. (7)  
b) Describe in detail the working of force sensors. (7)

**OR**

12. a) Explain the working of a Linear Variable Differential Transformer. (7)  
b) Identify the sensor is used in underwater robot to detect the object in its vicinity. Explain in detail. (7)

**MODULE II**

13. a) Define range sensor. Explain the optical triangulation (1D) sensor. (7)  
b) Illustrate IR sensors in robotic application. (7)

**OR**

14. a) Explain the working principle of Doppler radar. (7)  
b) Brief the concept of tactile sensing. Elaborate whether tactile sensors can be replaced by proximity sensors for robotic applications. (7)

**MODULE III**

15. Outline the various steps involved in vision system with neat diagram. (14)

**OR**

16. a) Explain the basic principle of a CCD camera. Compare it with CID cameras. (7)  
b) List the selection criteria for sensors. (7)

**MODULE IV**

17. a) Explain with diagram the components of a hydraulic system. (7)  
b) List the advantages & disadvantages of an electric motor and justify. (7)

**OR**

18. a) Explain the working principle of a two-phase stepper motor. Define half stepping. (7)  
b) List out the advantages and disadvantages of pneumatic & hydraulic actuators and justify. (7)

**MODULE V**

19. a) Explain the transmission mechanism in gears and elaborate on how the speed and torque can be adjusted. (7)  
b) Classify bearings and describe consideration for its selection. (7)

**OR**

20. a) Explain about cam and cam follower. (7)  
b) Brief microactuators. Outline the characteristics of the same. (7)

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