M.E. Second Semester (Mechanical Engineering (CAD/CAM)) (F.T.) (CGS)

13495 : Robotics and Robot Applications : 2 MCC 3

P. Pages : 2 | **AW - 3737**

Time : Three Hours | Max. Marks : 80

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Notes :
1. All question carry marks as indicated.
2. Answer **three** question from Section A and **three** question from Section B.
3. Assume suitable data wherever necessary.
4. Illustrate your answer necessary with the help of neat sketches.
5. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. a) Describe the configuration and work envelopes for different types of robots. **7**

b) What are the different types of controls used in robots? Explain. **6**

2. a) What are interlocks? Explain their types. **7**

b) Explain the electrical types of drive systems used in robots. **7**

3. a) What is EOAT? Describe with the help of suitable example. **7**

b) Describe the various functions performed by the controller and manipulator of an industrial robot. **6**

4. a) Describe various types of non-contact sensors used in robots. **7**

b) Explain the components of vision system used in robots. Draw the neat sketch of vision system. **6**

5. a) What do you mean by freedom of motion? Discuss the degree of freedom of a robot. **7**

b) Explain the following terms- **6**
i) Joint interpolation ii) Straight interpolation
iii) Circulation interpolation

SECTION - B

6. a) Describe the use of industrial robots for machining operation with the help of suitable example. **7**

b) Discuss the general considerations before selecting a robot for a particular application. **6**

7. a) Describe types of kinematics of a robot manipulator. **6**

b) Describe the forward and reverse transformation of 3DOF 2D robot arm. Draw suitable sketch. **7**

8. a) Compare and contrast the features of robots and robotic operations in case of spot and arc welding. **7**

b) Explain the various joint types in robots. **6**

9. a) The coordinates of a point q_{abc} are given by $(6, 4, 2)^T$ which are rotated about x-axis of the reference frame by angle of 30°. Determine the coordinates of the point q_{xyz}. **7**

b) For the following rotation matrix determine the axis of rotation and the angle of rotation about the same. **7**

$$R = \begin{bmatrix} 0.866 & 0 & 0.5 \\ 0 & 1 & 0 \\ -0.5 & 0 & 0.866 \end{bmatrix}$$

10. a) Describe the application of robots in inspection and quality control. **7**

b) Explain the tasks performed by robots in FMS environment. Draw the suitable diagrams. **6**

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