**AQ – 2769**

Second Semester M. E. (Mech. Engg.) (CAD/CAM) Examination

## ROBOTICS AND ROBOT APPLICATIONS

2 MCC 3

P. Pages : 2

Time : Three Hours ]                                                                    [ Max. Marks : 80

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**Note :** (1) Separate answer book must be used for each section in the subject Geology, Engineering material of civil branch and Separate answer book must be used for Section A and B in Pharmacy and Cosmetic Tech.
   (2) All question carry marks as indicated.
   (3) Answer **Three** questions from Section **A** and **Three** questions from Section **B**.
   (4) Assume suitable data wherever necessary.
   (5) Illustrate your answer wherever necessary with the help of neat sketches.
   (6) Use pen of Blue/Black ink/refill only for writing the answer book.

## SECTION A

1. (a) Explain the pneumatic drive system used in robots with the help of neat sketch.                                                                                7

   (b) Describe various approaches to teach the robots.                         6

2. (a) Describe various functions performed by the controller and manipulator of an industrial robot.                                                            7

   (b) What are interlocks ? Explain their types.                                6

3. (a) What are end effectors in robots ? Explain their types.                   7

   (b) Sketch and explain the types of joints commonly used in robots.          6

4. (a) What are the types of robot controls according to the level of sophistication of the robot controller ?                                                    7

   (b) Describe the hydraulic drive system used in robots with the help of neat sketch.                                                                                7

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5.  (a)  What are the evaluation strategies for investment of robots ? Explain.  7

     (b)  Describe the typical specifications of robot that define robot's performance capabilities.  6

## SECTION B

6.  (a)  Compare and contrast the features and performance specifications of robots and robotic operations in case of spot and arc welding.  7

     (b)  Explain the forward and reverse kinematics of three degrees of freedom robot arm. Draw suitable diagrams.  6

7.  (a)  If $[P]^m = [0, 5, 0, 1]^T$ represents the homogeneous coordinates of a point located 5 units along the second vector of a mobile coordinate frame. Rotate the mobile frame by $\frac{\pi}{4}$ radians about the second unit vector of F. Find the resulting homogeneous coordinate transformation matrix. Also find the physical coordinates of the point P in the fixed coordinate frame.  7

     (b)  Explain the role of robot in cellular manufacturing with the help of suitable diagram.  6

8.  (a)  Give and explain the non-industrial applications of robots.  7

     (b)  Identify various manufacturing situations that are suitable for robot applications.  6

9.  (a)  What are the reasons for successful application of robots in manufacturing industries ?  7

     (b)  Distinguish between AS/RS and material handling robots.  6

10.  (a)  Explain how the robots used for processing operations are different from others.  7

     (b)  Explain the general conditions that may be used as guidelines for using robots.  7