B.Tech. (Mechanical Engineering) Seventh Semester (C.B.C.S.)

Open Elective-II : Industrial Robotics

P. Pages : 2 **PSM/KW/23/8230**

Time : Three Hours * 2 2 8 7 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Explain Robot, its work volume & degree of Freedom (DOF). **7**

b) Explain types of robot programming method. Describe any one programming method in detail. **7**

OR

2. a) Explain the different types of drive systems used in robot actuation with their merit & demerits. **7**

b) Define Robot Anatomy. Discuss commonly used robot configuration system with neat sketch. **7**

3. a) Define end effectors in robot. Discuss tools as an End effector in various applications. **7**

b) Explain gripper used in robot. Also discuss in detail the selection and design considerations of grippers in robot. **7**

OR

4. a) What is a mechanical gripper? With neat sketch explain construction & working of any one type. **7**

b) With help of neat sketch describe pitch, yaw and roll motion of a robot wrist. **7**

5. a) Explain in detail Forward & reverse kinematics. **7**

b) For a two degree of freedom planar RR manipulator, if L1 and L2 are the lengths of the links 1 and 2 respectively and the angles $\theta 1$ and $\theta 2$, are the joint rotations, if L1 = 40cm, L2 = 30 cm and angles $\theta 1 = 60^{o}$ and $\theta 2 = 30^{o}$. Calculate the coordinates of the endpoint of the arm. **7**

OR

6.	a)	Explain Homogeneous transformation of various joints of Robot. Also discuss types of transformation.	**7**
	b)	For a vector $v = 25i + 15j + 10k$, perform rotation by an angle 90 about y-axis. Find the transformed vector.	**7**
7.	a)	What is the purpose of sensors in robotic system? Explain construction & working of piezoelectric sensor.	**7**
	b)	What is robot vision? Describe a vision sensor used to take the image of an object.	**7**

OR

8.	a)	Differentiate between the sensor & transducer. What are the various features to be considered while sensor selection.	**7**
	b)	What are the different types of sensors? Classify them. Explain working of proximity sensor with neat sketch.	**7**
9.	a)	What are the different types of robot cell layout? Explain any one with neat sketch.	**7**
	b)	Describe various methods used for Economic performance of Robots.	**7**

OR

10.	a)	Explain Robot consideration in pick & place operation with neat layout sketch.	**7**
	b)	Discuss multiple robot and machine Interference in Robot Cell.	**7**

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