Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**ME - SEMESTER– II(Old course) • EXAMINATION (Remedial) – WINTER- 2015**

**Subject Code: 1720803** **Date: 11/12/2015**

**Subject Name: Robotic Engineering**

**Time:2:30 pm to 5:00 pm** **Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

**Q.1** **(a)** Explain Different Robot Configurations with Figure **07**

**(b)** Define Robot. Compare hard automation and soft automation **07**

**Q.2** **(a)** Enlist different types of drives used in robotic system. Explain each in detail **07**

**(b)** Discuss advantages and disadvantages of Cartesian robots over other geometric configuration of robots **07**

**OR**

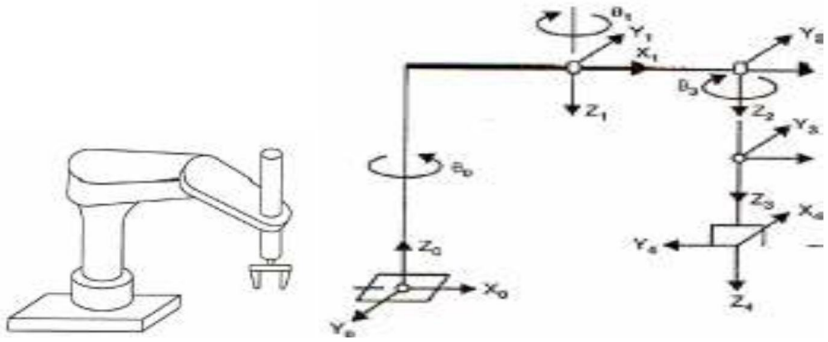
**(b)** Explain (i) Reach and Stroke of robot (ii) Tool orientation **07**

**Q.3** **(a)** Explain óRoll, Pitch & Yaw (RPY)ô angle configuration **07**

**(b)** Explain ñDifferent types of Gripper Mechanisms **07**

**OR**

**Q.3** **(a)** Tabulate kinematic joint and link parameters of SCARA robot (Fig.-1) by using D-H representation and derive kinematic equations by using arm matrices **07**



**(b)** Explain in detail ñD-H representation of forward kinematicsò with algorithm **07**

**Q.4** **(a)** Define and explain following terms. **07**

1. Spatial resolution 2. Accuracy
3. Repeatability 4. Compliance

**(b)** What is Danavit Hartenberg notation. Explain D-H parameter for forward kinematics of robot **07**

**OR**

**Q.4** **(a)** What is closed loop form of solution to inverse kinematic problem? Explain method of obtaining closed form solution **07**

**(b)** Derive the expression for ZYZ- Euler angles . State the use of such representations. Determine the orientation matrix R corresponding to Euler angles [15°, -35°, 52 ] **07**

**Q.5** **(a)** Explain the following terminologies in regard to robotics: **07**

ÅRedundant Manipulator ÅDegeneracy ÅDexterity
ÅDegree of freedom ÅLoad carrying capacity ÅWork envelope

ÅSpeed of response

| | | | |
|---|---|---|---|
| | **(b)** | Explain ñStepper Motorò in Control System | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Explain different types of joints in robots | **07** |
| | **(b)** | Write short note on ï ñProximity and range sensors | **07** |

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