Code No: **R32032** **R10** **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April - 2018

ROBOTICS

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1 a) Sketch and explain the four basic robot configuration. [8M]
b) What is the future scope of Robotics? [7M]

2 a) What is end effector? Explain the different types of end effectors. [8M]
b) How many DOFs are required to position an end-effector at any point in 3-D space? Justify. [7M]

3 a) What do you mean by homogeneous coordinates? Explain. [7M]
b) Explain in detail the various interpretations of Homogeneous transformation matrix. [8M]

4 a) Find the D-H matrix for R-R manipulators. [7M]
b) Solve the inverse kinematics problem for the joint angles θ_1, θ_2, θ_3, θ_4, θ_5, and θ_6. [8M]

Joint i	θ	α	a	d
1	θ_1	-90^0	0	d1
2	θ_2	0^0	a_2	0
3	θ_3	0^0	a_3	0
4	θ_4	-90^0	a_4	0
5	θ_5	90^0	0	d5
6	θ_6	0^0	0	d6

5 a) What do you mean by Internal Singularities? [8M]
b) Compute the Jacobian Martix for a three link planar arm with Revolute joints. [7M]

6 a) Define the following commands [9M]
i) WAIT ii) SIGNAL iii) DELAY
b) List out the constraints for planning joint interpolated trajectory. [6M]

7 a) Explain the operation of optical encoder used in robot as a feedback device. [8M]
b) Compare and contrast hydraulic and Electrical actuators. [7M]

8 Explain how to design a robot for an automobile industry to carry out welding Operation. [15M]

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