Code No: D0607 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH II - SEMESTER EXAMINATIONS, APRIL/MAY 2012
ROBOTICS
(DIGITAL SYSTEMS AND COMPUTER ELECTRONICS)

Time: 3hours **Max. Marks: 60**

Answer any five questions
All questions carry equal marks

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1.a) Discuss the anatomy of Robot and explain the important parts of a robot with a neat sketch.
b) Explain the difference between Cartesian coordinate representation and Homogeneous coordinate representation with an example.

2.a) Discuss the general properties of inverse kinematics problem of a Robot and solve a 2 link RR Manipulator for obtaining position and orientation using inverse kinematics problem.
b) What is hybrid control? Explain the hybrid control of manipulation.

3.a) What are the different types of sensors used in robots? Explain the suitable sensor to measure the position of the gripper accurately.
b) In the event of a malfunction in the encoder or the drive system, what kind of safety features can be incorporated in the system to prevent loss due to damage?

4.a) Explain the REACT statement of Robot languages, which is used to monitor an incoming signal and to respond to a change in the signal.
b) Discuss the important characteristics of robot-oriented language-motion specification.

5.a) Differentiate between incremental and absolute encoders?
b) A resolver is to indicate angular position at a rotational wrist joint. The excitation voltage to the resolver is 24 V. The resolver is connected to the wrist joint so that a given rotation of the output link corresponds to an equal rotation of the resolver. At a certain moment in time, the movement of the wrist joint results in voltage across the two pairs of stator terminals to be 10 V and -21.82 V. Determine the angle of the rotational joint.

6.a) What are the different hill climbing techniques? Explain any one method.
b) Explain how the angular position is calculated in an incremental encoder.

7.a) What do you mean by linear stepper motor? Explain.
b) For an absolute optical encoder with 10 tracks, determine the value of the number of pulses per radian and the encoder constant. If the shaft angle of the encoders were 0.73 rad, determine its output value.

8.a) Explain the safety considerations to be followed while programming robots.
b) Explain YPR notation and its significance in robotics.

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