Exam. Seat No._____

GANPAT UNIVERSITY

M.Tech Sem. II nd (CAD-CAM)

Regular External Examination July 2013

3ME214 Robotics and Intelligence Manufacturing

Time: 3 Hrs **Marks: 70**

Instructions:

(i) All questions are compulsory.
(ii) Answers to two sections must be written in separate answer sheets.
(iii) Assume suitable data wherever necessary.
(iv) Figure to right indicates marks.

SECTION – I

Q1 *Answer the following Questions.* **12**

(a) Define the degree of freedom for a open and closed kinematic pairs.

(b) Define : load carrying capacity, work volume.

(c) Explain why homogeneous transformations are required in modeling of robotic manipulators.

(d) Determine the rotation matrix for a rotation of 45^0 about y-axis, followed by a rotation of 120^0 about z-axis, and a final rotation of 90^0 about x-axis.

OR

Q1 *Answer the following Questions.* **12**

(a) Describe an expression for identity matrix from mapping between rotated frame and cosine rule for unit vectors dot product inside matrix.

(b) The coordinates of point P with respect to a moving coordinate frame are given as $P= [\ 0.8, 0.4, 1.3, 1]^T$. What are the coordinates of P with respect to fixed coordinate frame, If the moving frame is rotated by 70^0 about y-axis of the fixed frame?

(c) Differentiate cylindrical and SCARA configuration of robot.

Q2 *Answer the following Questions.* **12**

(a) Explain the factors on which the number of solutions to given inverse kinematic model depend.

(b) Describe the workspace of a manipulator. Make a list of factors on which the workspace, the dexterous and reachable work space, of a given manipulator depends.

(c) A 3 DOF articulated configuration arm of manipulator has all three revolute Joints. In a typical articulated arm the joints design determines the joint range the design of joint provides almost 360^0 joint range but has joint offset / joint distance $d_1=d_2$ For link 2& d_3 for link 3, Using the algorithm for link frame assignments, tabulate the joint link parameters and obtain forward kinematic model of the arm.

OR

Q2 *Answer the following Questions.* **12**

(a) Why closed loop form solutions are preferred over numerical interactive or other form of solutions to the inverse kinematic problem?

(b) Explain the terms : Solvability of an inverse kinematic model, Multiple solutions, Redundant manipulator, Joint & Cartesian space.

(c) Obtain forward kinematic model for configuration shown in fig.1.

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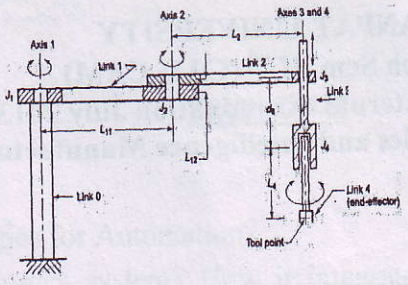

Fig. 1 Que. 2(c)OR

Q3 *Answer any **Three** form the following Questions:* **11**

(a) (i)Why D-H convention does not give unique frame assignment for a given manipulator?
(ii) "The forward kinematic model of a manipulator depends on the choice of home position of manipulator". Comment on this statement.

(b) What is difference between gripper and tool? Explain importance of duel gripper over single gripper in machine loading /unloading application.

(c) Define link parameters and joint parameters with sketch.

(d) State guide lines to obtain close form solutions for an inverse kinematics problem.

SECTION – II

Q4 *Answer the following Questions.* **12**

(a) Discuss the different intelligence techniques used in Manufacturing Process.

(b) Explain Knowledge triangle and its each term.

(c) Discuss A* algorithm with an example.

OR

Q4 *Answer the following Questions.* **12**

(a) What is AI? Explain different AI levels applied in robotic engineering.

(b) Discuss Breadth first search procedure with an example.

(c) Explain water-jag problem by defining rules.

Q5 *Answer the following Questions.* **12**

(a) Prove D'morgen principal in fuzzy theory.

(b) Write fuzzy rules for robotic gripping force.

(c) What is the different type of Hebbian learning in ANN?

OR

Q5 *Answer the following Questions.* **12**

(a) What is inference engine? Explain fuzzy inference engine with defining rules of EDM machine.

(b) What is meant by topology of ANN? Give few basic topological structure of ANN?

(c) Explain any one fuzzification process.

Q6 *Answer any three of following Questions.* **11**

(a) How ANN works? Explain Robertson perception Model of ANN.

(b) Explain ANN terminology : Processing unit, Interconnections, Operations, Activation Dynamics

(c) Explain Architecture of Expert system for manufacturing processes.

(d) Differentiate between Expert System and Decision support system.

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