

IV B.Tech. II Semester Supplementary Examinations, July -2005
ROBOTICS
(Computer Science & Engineering)
Time: 3 hours**Max Marks: 80**
Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define the term 'ROBOT' and describe the robot anatomy.
 (b) Explain the principle of Inverse kinematics problem.
2. What is adaptive control? Explain the principle of adaptive control using an autoregressive model.
3. Explain the principle and working of any three tactile sensors.
4. (a) Explain the principle of robot vision.
 (b) Explain the techniques used in high level vision.
5. (a) Discuss the following terms.
 - i. Knowledge data base
 - ii. Inference engine.
 (b) With the help of a block diagram, explain the various modules of Artificial Intelligence.
6. (a) What is task planning?
 (b) How the robot task planning problem is solved by a problem-solving system? Describe it with the help of an example.
7. calculate the total machine time, idle time, and machine interference for three machines in the cell which has the defined time as follows:

M/C	Runtime	Service time	Process time
1	20 Sec	20 Sec	40 Sec
2	60 Sec	30 Sec	50 Sec
3	40 Sec	20 Sec	40 Sec

Writ the Robot and machine process chart.

8. Write the detailed listing of work cycle elements of a Robot. Two conveyors which are perpendicular to each other and at a distance of 25 cm. with width of the conveyor being 40 cm.
 Robot picks up part from first conveyor which has delivered the part to a known pick up position.
 Robot transfers part to second conveyor and releases part
 Robot moves back to ready position at first conveyor
 Conveyor delivers one part every 20 sec.

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1. Explain with suitable example the Denavit - Hartenberg representation.
2. (a) Briefly explain the computed torque technique.
(b) Discuss the main disadvantages of using the resolved motion acceleration control.
3. Explain the principle and working of any three proximity sensors.
4. (a) Explain the principle of robot vision.
(b) Explain the techniques used in high level vision.
5. Write an AML statement for defining a coordinate frame 'grasp' which can be obtained by rotating the coordinate frame 'block' through an angle of 65° about the Y axis and then translating it 100 and 150 mm in the X and Y axes, respectively.
6. (a) Define the following terms used in robot task planning:
 - i. Problem state
 - ii. State space
 - iii. Initial state
 - iv. Goal State
(b) Explain how the predicate logic is used to derive answer to questions and solutions to problems in solving the robot problems.
7. "Work volume of a Robot forms the basis of Robot cell design" justify the statement with different anatomies of the Robot with a neat sketch.
8. Explain clearly the three levels of Robot programming in work cell design and control with an example.

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1. (a) Define the term 'ROBOT' and describe the robot anatomy.
(b) Explain the principle of Inverse kinematics problem.
2. Explain the principle of variable structure systems for the control of manipulators.
3. Explain various applications of end effectors in medical field.
4. (a) Explain the following
 - i. global thresholds
 - ii. local thresholds.(b) Explain the optimum threshold selection method.
5. (a) Explain the differences between robot programming and traditional programming.
(b) What is the role of inference engine in Artificial Intelligence? Briefly explain.
6. Is it possible to obtain a Breadth-first algorithm from the AO^* algorithm? If yes, explain the procedure and write the corresponding Breadth first algorithm. If not, explain why and write the AO^* ALGORITHM.
7. With reference to work cell design briefly explain the following:
 - (a) Charges to other equipments in the cell
 - (b) Part position and orientation in the cell
 - (c) Part identification in the cell.
8. (a) Explain the functions performed by work cell controller.
(b) Describe three categories of work cell controller.

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1. (a) List out various robot arm categories and explain them with neat sketches.
(b) Explain the following for positioning subassembly:
 - i. the spherical coordinate system representation.
 - ii. the cylindrical coordinate system representation.
2. What is resolved motion? Explain the hand coordinate system with a neat sketch.
3. (a) Explain the principle and working of (i) expandable bladder, (ii) diaphragm with neat sketches.
(b) Explain various applications of mechanical grippers in manufacturing.
4. Explain the four principal schemes used for illuminating a robot work space.
5. (a) Discuss the characteristics of Robot languages.
(b) What are the basic elements of the robot language? Explain briefly.
6. What is Graph-Search technique ? Describe the procedure to produce the desired solution by a general graph-search technique.
7. “Work volume of a Robot forms the basis of Robot cell design” justify the statement with different anatomies of the Robot with a neat sketch.
8. What is programmable controller? How programmable controllers are used to control the robotic cell? Explain with an example?
