

Enrollment No: _____

Exam Seat No: _____

C. U. SHAH UNIVERSITY

Summer Examination- 2022

Subject Name: Industrial Robotics

Subject Code: 4TE08IRO1

Branch: B.Tech (Mechanical)

Semester: 8

Date: 05/05/2022

Time: 11:00 To 02:00

Marks: 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
 - (2) Instructions written on main answer book are strictly to be obeyed.
 - (3) Draw neat diagrams and figures (if necessary) at right places.
 - (4) Assume suitable data if needed.
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Q-1

Attempt the following questions:

(14)

- (a) Robot Anatomy is concerned with the physical construction of:
(A) The body (B) Arm (C) Wrist (D) All of these
- (b) The Robot designed with Polar coordinate systems has
(A) Three linear movements
(B) Three rotational movements
(C) Two linear and one rotational movement
(D) Two rotational and one linear movement
- (c) Drives are also known as
(A) Actuators (B) Controller (C) Sensors (D) Manipulator
- (d) The rotor of a stepper motor has no
(A) Windings (B) Commutator (C) Brushes (D) All of the mentioned
- (e) According to Denavit- Hartenberg notations, joint angle is defined as the
(A) angle between two Z axes measured about X axis
(B) angle between two X axes measured about Z axis
(C) angle between two Y axes measured about X axis
(D) angle between two Y axes measured about Z axis
- (f) Forward kinematics and Reverse kinematics of a serial manipulator will have
(A) multiple solutions and unique solution respectively
(B) unique solution and multiple solutions respectively
(C) unique solution only
(D) multiple solution only
- (g) End effectors can be classified into two categories which are
(A) elbows and wrists (B) grippers and end of arm tooling
(C) grippers and wrists (D) end of arm tooling and elbows



- (h) _____ Grippers are used to pick up light weight materials such as paper, cloth etc.
 (A) Mechanical grippers (B) Magnetic grippers
 (C) Vacuum cup grippers (D) Adhesive grippers
- (i) Touch sensors are classified under the category of:
 (A) Range sensor (B) Tactile sensor (C) Machine vision (D) Force sensor
- (j) Which is the image processing technique used to improve the quality of image for human viewing?
 (A) Enhancement (B) Compression (C) Restoration (D) Analysis
- (k) The Robot is performing the sequence of instructions in the program during _____ mode:
 (A) Monitor mode (B) Edit Mode (C) Run mode (D) None of these
- (l) The walk through method of robot programming is also called as:
 (A) Powered lead through method (B) Manual lead through method
 (C) Both of above method (D) None of these
- (m) The robot is located along a moving conveyor or other handling system and perform a task on the product as it travels pass on the conveyor is called:
 (A) Robot Cantered Work cell (B) Mobile robot cell
 (C) In- line Robot cell (D) Miscellaneous robot cell
- (n) Interlocks is the method for
 (A) Preventing the work cycle sequence from continuing unless a certain condition or set of conditions are satisfied.
 (B) Execution of the work cycle to be repeated over and over for efficient operation of the robot cell.
 (C) To override the regular work cycle in the event of observed safety hazard.
 (D) To provide a means for human operators to interact with the operation of the cell.

Attempt any four questions from Q-2 to Q-8.

Q-2 Attempt all questions

- (a) Explain different Robot Configurations with neat sketches. (07)
 (b) Enlist different types of drives used in robotic system. Explain each in detail. (07)

Q-3 Attempt all questions

- (a) Explain “Stepper Motor” in Control System. (07)
 (b) Explain in detail “D-H representation of forward kinematics” with algorithm. (07)

Q-4 Attempt all questions

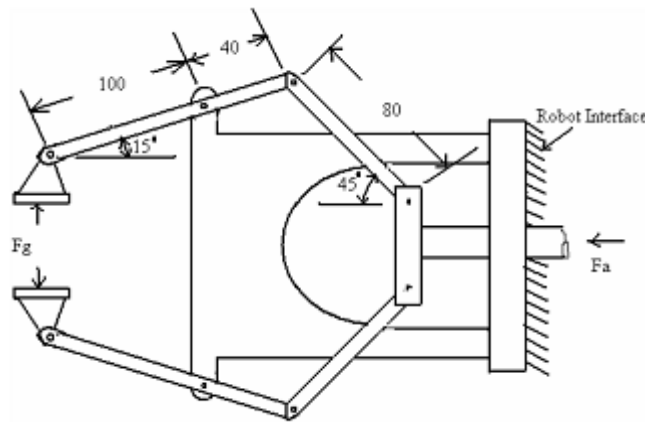
- (a) Explain direct and inverse kinematics with transformation matrix. (07)
 (b) Explain different factors which influence the selection and design of grippers. (07)

Q-5 Attempt all questions

- (a) Explain desirable features of Sensors. (07)



- (b) Fig. shows the linkage mechanism and dimensions of a gripper used to handle a work part for a machining operation. Suppose it has been determined that the gripper force is to be 100 N. Compute the required actuating forces to deliver this force of 100 N. All Dimensions are in mm. (07)



Q-6

Attempt all questions

- (a) Describe image processing and analysis in detail for robotic vision system. (07)
 (b) Write a short note on: AI and Robotics. (07)

Q-7

Attempt all questions

- (a) Explain different methods of defining position in space to actuate the robot arm and wrist. Give reasons for defining points in a program (07)
 (b) Enlist robot cell layouts. Compare “Robot centered cell” and “Inline robot cell”. (07)

Q-8

Attempt all questions

- (a) Discuss general considerations in robot assembly operations. (07)
 (b) Define following terms in context of precision movement of robots: (i) Spatial Resolution, (ii) Accuracy, (iii) Repeatability and (iv) Compliance (07)

