C.U.SHAH UNIVERSITY
Winter Examination-2019

Subject Name: Industrial Robotics

Subject Code: 4TE08IRO1   **Branch: B.Tech (Automobile, Mechanical)**

Semester : 8   **Date : 17/09/2019**   **Time : 10:30 To 01:30**   **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.

Q-1   **Attempt the following questions:**   **(14)**

a) Robot is derived from Czech word
(A) Rabota   (B) Robota   (C) Rebota   (D) Ribota

b) A Robot is a
(A) Programmable   (B) Multi functional manipulator
(C) Both (A) and (B)   (D) None of the above

c) Drives are also known as
(A) Actuators   (B) Controller   (C) Sensors   (D) Manipulator

d) Match the following

Robot part	Function
a. Manipulator arm	1. For holding a piece or tool
b. Controllers	2. Move the manipulator arm and end effector
c. Drives	3. Number of degrees of freedom of movement
d. Gripper	4. Delivers commands to the actuators

(A) a-1, b-4, c-2, d-3   (B) a-3, b-4, c-2, d-1
(C) a-3, b-2, c-4, d-1   (D) a-4, b-3, c-2, d-1

e) Clockwise of Anti clockwise rotation about the vertical axis to the perpendicular arm is provided through
(A) Shoulder swivel (B) Elbow extension (C) Arm sweep (D) Wrist bend

f) Radial movement (in & out) to the manipulator arm is provided by
(A) Elbow extension (B) Wrist bend (C) Wrist swivel (D) Wrist yaw

g) 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

h) In which of the following operations Continuous Path System is used
(A) Pick and Place   (B) Loading and Unloading

(C) Continuous welding   (D) All of the above

i) Internal state sensors are used for measuring _____ of the end effector.
(A) Position   (B) Position & Velocity
(C) Velocity & Acceleration   (D) Position, Velocity & Acceleration

j) Which of the following sensors determines the relationship of the robot and its environment and the objects handled by it
(A) Internal State sensors   (B) External State sensors
(C) Both (A) and (B)   (D) None of the above

k) Which is the image processing technique used to improve the quality of image for human viewing?
(A) Compression   (B) Enhancement   (C) Restoration   (D) Analysis

l) Which of the following is not a programming language for computer controlled robot?
(A) AMU   (B) VAL   (C) RAIL   (D) HELP

m) What classification is given to robots which grip tools, for example, in various types of metalworking operations, joining of materials, and surface treatment.
(A) Tooling robots   (B) Process robots   (C) Handling robots   (D) Assembly robots

n) Dead reckoning is a good way to navigate because
(A) It does not require proprioceptive sensors
(B) Odometry errors are non-deterministic
(C) Low-resolution encoders have noise
(D) None of the above

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

Q-2   **Attempt all questions**
(a) With the help of a figure explain the three broad classes into which industrial automation is classified.   **(07)**
(b) Explain the relative merits and demerits of hydraulic, pneumatic and electrical drive systems.   **(07)**

Q-3   **Attempt all questions**
(a) Explain Different Robot Configurations with Figure.   **(07)**
(b) Describe about Stepper Motors.   **(07)**

Q-4   **Attempt all questions**
(a) Explain in detail "D-H representation of forward kinematics" with algorithm.   **(07)**
(b) Explain different factors which influence the selection and design of grippers.   **(07)**

Q-5   **Attempt all questions**
(a) Describe different types of Gripper Mechanisms.   **(07)**
(b) Write short note on – "Proximity and range sensors".   **(07)**

Q-6   **Attempt all questions**
(a) Explain capabilities and limitations of Lead through robot programming methods.   **(07)**
(b) Consider a vision system using a vidicon tube. An analog video signal is generated for each line of the 512 lines comprising the faceplate. The sampling capability of the A/D converter is 100 nanoseconds (100×10^{-9}s). This is the cycle time required to complete the A/D conversion process for one pixel. Using the American standard of 33.33 milliseconds (1/30 s) to scan the entire faceplate consisting of 512 lines, determine the sampling rate and the number of pixels that can be processed per line.   **(07)**

Q-7   **Attempt all questions**

    (a)   Write a short note on: AI and Robotics.   **(07)**

    (b)   Explain Different types of Robot Cell Layouts.   **(07)**

Q-8   **Attempt all questions**

    (a)   Explain Compliance and the Remote center compliance (RCC) device.   **(07)**

    (b)   Explain Robot Application in "Material Transfer & Machine Loading/ Unloading System".   **(07)**