Enrollment No: _____   Exam Seat No:_____

C.U.SHAH UNIVERSITY
Summer Examination-2018

Subject Name: Industrial Robotics

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

Semester: 8   **Date: 01/05/2018**   **Time: 02:30 To 05:30**   **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) According to Asimov's three laws, under what circumstances is it all right for a robot to injure a human being?
(a) When the human being specifically requests it
(b) Never
(c) In case the robot controller is infected with a computer virus
(d)In case of an accident

b) Robot Anatomy is concerned with the physical construction of:
(a) The body   (b) Arm   (c) Wrist   (d) All of these

c) Kinematic designation RPP is used for
(a) Polar   (b) Jointed Arm   (c) Cylindrical   (d) Cartesian Coordinate

d) The following drive is used for larger Robot
(a) Electrical   (b) Mechanical   (c) Pneumatic   (d) Hydraulic

e) The armature winding are in stator and the permanent magnets are in rotor in following electric motor assembly:
(a) DC Brushless motor   (b) DC Brushed motor
(c) Both (a) and (b)   (d) None of these

f) Industrial Robots are generally designed to carry which of the following coordinate system(s).
(a) Cartesian coordinate systems   (b) Polar coordinate systems
(c) Cylindrical coordinate system   (d) All of the above

g) In Magnetic Grippers the stacking device used to hold the sheets can be designed to separate sheets for pickup by the robot called as:
(a) Foster   (b) Holder   (c) Catcher   (d) Fanner

h) 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

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) Touch sensors are classified under the category of:
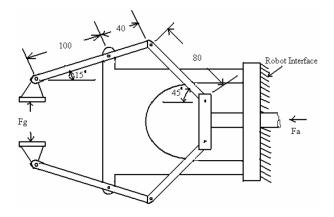(a) Range sensor   (b) Tactile sensor   (c) Machine vision   (d) Force sensor

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) 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

n) 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 Centered Work cell   (b) In- line Robot cell
(c) Mobile robot cell   (d) Miscellaneous robot 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)	Explain "Stepper Motor" in Control System.	**07**
Q-3		**Attempt all questions**	
	(a)	Define following terms in context of precision movement of robots: (i) Spatial Resolution, (ii) Accuracy, (iii) Repeatability and (iv) Compliance	**07**
	(b)	Enlist different types of drives used in robotic system. Explain each in detail.	**07**
Q-4		**Attempt all questions**	
	(a)	Describe image processing and analysis in detail for robotic vision system.	**07**
	(b)	Enlist robot cell layouts. Compare "Robot centered cell" and "Inline robot cell".	**07**
Q-5		**Attempt all questions**	
	(a)	Write short note on – "Proximity and range sensors".	**07**
	(b)	Explain Robot Application in "Material Transfer & Machine Loading / Un Loading System".	**07**
Q-6		**Attempt all questions**	
	(a)	Explain robot language structure in detail.	**07**
	(b)	Explain different methods of defining position in space to actuate the robot arm and wrist.	**07**
Q-7		**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-8		**Attempt all questions**	
	(a)	Explain in detail "D-H representation of forward kinematics" with algorithm.	**07**

(b) Fig. Shows the linkage mechanism and dimensions of a gripper used to handle a   **07**
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.