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**Question Paper Code:49508**

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2018

Elective

Electronics and Instrumentation Engineering

14UEI908- ROBOTICS AND AUTOMATION

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. For a robot unit to be considered a functional industrial robot, typically, how many degrees of freedom would the robot have?  
(a) 6 (b) 5 (c) 4 (d) 2 CO1- R
2. \_\_\_\_\_ of a robot is the smallest increment of movement into which the robot can divide its work volume  
(a) Spatial resolution (b) Accuracy (c) Repeatability (d) Range CO1- R
3. Heavy lifting work is often accomplished by shifting fluids in big machines. The power system of such machines can be described as  
(a) Reciprocating (b) Pneumatic (c) Hydraulic (d) Hybrid CO2- R
4. Both stator and rotor there are eight teeth of a 3 stack four pole stepper motor, when the excitation is changed from one stack to another to the next. Determine the step angle.  
(a) 10 degree (b) 15 degree (c) 20 degree (d) 25 degree CO2- R
5. The \_\_\_\_\_ method is used in IR type range sensor to measure the distance of the object  
(a) reflected light intensity (b) triangulation  
(c) refraction light intensity (d) total internal reflection CO3- R
6. Magnetic type gripper need \_\_\_\_\_  
(a) smooth surface to hold (b) surface without any hold  
(c) one side of surface to hold (d) corner less surface to hold CO3- R

7. The 2-DOF universal joint is the combination of intersecting of CO4- R
- (a) Two revolute joints (b) Two prismatic joints
- (c) Two Helical joints (d) Two planner joints
8. The inverse kinematics problem is much more complex because CO4- R
- (a) The equation to be solved are in general non-linear in joint variables
- (b) Multiple solutions may exist
- (c) There might be no admissible solutions
- (d) non-linear in joint variables and multiple solution
9. The size and shape of the robot body is given by following parameters CO5- R
- (a) Link length (b) Joint angle
- (c) Link length and Twist angle (d) Joint angle and Joint offset
10. A PUMA robot usually consists of CO5- R
- (a) Six revolute axes (b) Five revolute axes
- (c) Four revolute axes (d) Three revolute axes

PART – B (5 x 2= 10Marks)

11. State Asimov's laws of Robotics. CO1- R
12. Compare the pneumatic and hydraulic drives. CO2- Ana
13. Define links, joints and their parameters. CO3- R
14. What do you mean by Jacobian work envelope. CO4-U
15. Write short notes on the selection criteria of robot. CO5-U

PART – C (5 x 16= 80Marks)

16. (a) (i) Illustrate the basic structure of robot. CO1-U (8)
- (ii) Classify the robots based on degrees of freedom and drive technology. CO1-U (8)
- Or
- (b) (i) Explain the dynamic stabilization of robotics. CO1-U (8)
- (ii) Outline the various generation of robots. CO1-U (8)

17. (a) Explain the function of machine vision systems in robotics. CO2-U (16)
- Or
- (b) Explain the functions of magnetic, fiber optic and tactile sensors used in robotics. CO2-U (16)
18. (a) (i) Outline the concepts of manipulator dynamics and force control. CO3-Ana (8)
- (ii) Compare the function of electronics and pneumatic manipulator control circuits. CO3-Ana (8)
- Or
- (b) (i) Summarize the design considerations of grippers. CO3-Ana (8)
- (ii) Compare the function of end effector and manipulator. CO3-Ana (8)
19. (a) Explain inverse kinematics for a robotic arm to determine the joint angle for a desired position of the arm. CO4-U (16)
- Or
- (b) (i) Interpret the function of different types of programming language used in robotics. CO4-U (10)
- (ii) Outline the concepts of Hill Climbing Techniques. CO4-U (6)
20. (a) Exemplify the application of robot in manufacturing and non-manufacturing field. CO5-U (16)
- Or
- (b) (i) Explain the operation of Multiple robots. CO5-U (8)
- (ii) Summarize the robot cell design concepts. CO5-U (8)

