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Question Paper Code : 71703

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B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Sixth/Eighth Semester

Electronics and Communication Engineering

EC 6003 – ROBOTICS AND AUTOMATION

(Common to Medical Electronics Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write about the origin of robot.

2. What are the subsystems of industrial robot?

3. Name the common imaging device used for robot vision system.

4. State the different types of range sensing techniques.

5. Draw the block diagram of manipulator and mention its building blocks.

6. List the various classification of gripper mechanism.

7. Calculate the inverse of the following transformation matrix,

$$\begin{pmatrix} 0.5 & 0 & 0.866 & 3 \\ 0.866 & 0 & -5 & 2 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

8. What are the basic methods of robot programming?

9. List the application of robots used in manufacturing system and non manufacturing Systems.

10. List the factors to be considered while selecting robot.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define Robot (RIA). Also write the types of robots. (8)

(ii) With help of sketch describe pitch, yaw and roll motion of a robot wrist. (8)

Or

(b) (i) Write Asimov's laws of robotics. (6)

(ii) Explain the different types of robot configuration. (10)

12. (a) (i) Explain about different types of tactile sensors with neat sketch. (8)

(ii) Explain the functions of machine vision system with block diagram. (8)

Or

(b) (i) Discuss about different types of range sensors. (8)

(ii) Write the comparison between Hydraulic, Pneumatic and Electrical drive systems. (8)

13. (a) Explain the difference types of gripper mechanism used in robots manipulator? Also explain about three fingered and two fingered gripper with sketch. (16)

Or

(b) (i) Write the design consideration of Grippers. (8)

(ii) Design a pneumatic control circuit for a robot with sketch. (8)

14. (a) (i) Discuss about different generations of robot programming languages. (8)

(ii) Write a simple program in VAL language for suitable for ARC welding. (8)

Or

(b) (i) Derive inverse kinematic algorithm of LL robot and RR robot. (8)

(ii) Derive the general Jacobian matrix. (8)

15. (a) Discuss about robot cell layouts for the following types: (i) Robot centered cell (ii) In-line robot cell (iii) Mobile robot cell. (16)

Or

(b) Write a palletizing program to pick the parts protruding from the pallet and place them in a location some distance apart. The parts are arranged orderly in rows and columns. (16)