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Question Paper Code : 21546

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Seventh Semester

Mechanical Engineering

ME 2028/ME 702/ IC 1404/080120060 — ROBOTICS

(Common to Production Engineering and Automobile Engineering)

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Classify the robot as per the type of control and mobility.
2. Define work envelope and give geometry of work envelope for Cartesian robot.
3. What are the two major types of end effector?
4. How will a sensor be evaluated?
5. Briefly explain the function of a piezoelectric sensor.
6. What is image analysis?
7. What is inverse kinematics?
8. Write down the basic types of robot programming.
9. List out few robot applications area in manufacturing.
10. What are the functions of work cell controller?

PART B — (5 × 16 = 80 marks)

11. (a) Describe briefly the anatomy of an industrial robot and its motion. (16)

Or

- (b) Describe the specifications of an industrial robot and with its configuration. (16)

12. (a) Discuss about the salient features of different drive systems used in robots. (16)

Or

- (b) Explain the types of end effector and gripper mechanisms with simple sketches. (16)
13. (a) Describe the basic functions of a typical machine vision system with block diagram. (16)

Or

- (b) Describe the classification of sensors and the factors to be considered for its selection. (16)
14. (a) Write a VAL robot program to perform pick-and-place operation on the conveyer system. It consist of two conveyors running parallel with centre to centre distance of 600 mm at same level. An industrial robot is fixed centrally between the conveyors. The robot is used to transfer work pieces from conveyor 1 to 2 at a constant speed. Draw a schematic view of the system. Assume all necessary dimension. (16)

Or

- (b) (i) Consider two frames {A} and {B}. The frame {B} is rotated with respect to frame {A} by 30° around z-axis and the origin of {B} is shifted with respect to the origin of {A} by [5,10,5]. The Z_A and Z_B axes are parallel. A point 'P' is described in {B} by (1, 2, 3). Describe the same point with respect to {A} using the transform matrix ${}^A T_B$. (8)
- (ii) Write short note dynamics of a robot. (8)
15. (a) Describe the general approach to implement robots in an industry. (16)

Or

- (b) Write short note on Equivalent Uniform Annual Cost and Rate of return methods. (16)