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**Question Paper Code : 21830**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Seventh Semester

Mechanical Engineering

ME 2028/ME 702/IC 1404/080120060/10177 MEE 22/10122 MEE 22 — ROBOTICS/  
INDUSTRIAL ROBOTICS

(Common to Production Engineering and Automobile Engineering)

(Regulations 2008/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define world coordinate system and tool coordinate system in a robot.
2. Draw a suitable diagram to represent pitch, yaw and roll.
3. Write the salient features of a servo motor.
4. What is end effector and give any two example?
5. Mention any two examples for contact and non-contact sensor.
6. What are area of application of image processing in the field of robotics?
7. Differentiate between the forward and inverse kinematics and give its application.
8. What are limitations of on-line and off-line robot programming?
9. Distinguish between the AGV and Robot.
10. Mention the limitations of implementing robots in industry.

PART B — (5 × 16 = 80 marks)

11. (a) Explain any five work envelop of a robot with suitable diagram and mention its application.

Or

- (b) Describe the important specifications of a robot and choose a suitable robot configuration for transferring 200 gram aluminum rod of 150 mm length. Give your justification.
12. (a) Compare the servo motor with stepper motor choose suitable drive system for industrial robot along with your justification.

Or

- (b) Classify the end effector. Draw the different mechanism used in the gripper and give application.
13. (a) Explain the working principle of LVDT, Hall Effect sensor and compliance sensor along with respective circuit. Give the limitations of all three sensor mentioned.

Or

- (b) Write any one algorithm for edge detection and segmentation of an image. Describe the industrial applications of image processing in the field of mechanical engineering.
14. (a) Explain the four statements of VAL robot programming language with at least two example command. Write a VAL program for pick-and-place operation for your assumed environment. Draw your environment diagram showing the industrial robot.

Or

- (b) Illustrate the forward kinematics of a 3 DoF industrial robot with rotational joints. Draw suitable diagram for your illustration. Mention the advantages of forward kinematics over inverse kinematics.
15. (a) Discuss the various steps to be taken for implementing robots in industry and safety issues. Write the advantages of using robots in industry.

Or

- (b) Illustrate the pay back and rate of return method of economic analysis while implementing robots in industry with suitable example problem.