B. Tech.

(SEM. VIII) EXAMINATION, 2006-07

ANALYSIS ROBOTICS & MECHATRONICS

Time : 3 Hours] [Total Marks : 100

Note : Attempt all questions.

1 Attempt any four parts of the following :

(a) Define the term robotics. Explain the difference between hard automation and robotics. Write in brief about different performance characteristics that determine the qualities and abilities of a robot.

(b) Explain in brief the history of robots. What are factors that slow down the growth and implementation of robotics technology?

(c) Discuss in brief any three applications of robots.

(d) Discuss different ways of classifying robots.

(e) Discuss the kinematic problems related to a robot system. Also describe end effector and gripper systems.

(f) Give a brief account of drive systems used for robots.

2 Attempt any four parts of the following :

(a) Discuss the basic categories under which the sensors of industrial robots are put.

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(b) What are tactile sensors? Discuss tactile sensors with example.

(c) What are proximity sensors? Discuss any two types of proximity sensors.

(d) Give the working principle of a Hall-effect transducer. Explain its any two applications in robotic systems.

(e) Explain with a simple example. How will you obtain a dynamic model for a robotic system?

(f) Describe any two methods of sensing acceleration in a robotic system and also give a comparison of the methods discussed.

3 Attempt any two parts of the following:

(a) What do you understand by the term machine vision? Explain with a suitable block diagram the functions of a machine vision system.

(b) Describe the sensing and digitilizing function in machine vision.

(c) Discuss the important image processing and analysis techniques.

4 Attempt any two parts of the following:

(a) Give a brief account of different actuators used in robots.

(b) Write the basic equations of motion of dc motor used as an actuator to drive a load. Also give a block diagram representation for the same.

(c) Discuss any two methods of braking a dc actuator of a robot. Also give a comparison the methods discussed.
Attempt any **two** parts of the following:

(a) Discuss the issues involved in controlling the robotic manipulator so that it follows a preplanned path.

(b) What are the different ways to split a joint trajectory? Explain with suitable example the step involved in the calculation of a 4-3-4 joint trajectory.

(c) Give a classification of motion control methods of a robotic manipulator. Also discuss in brief the computed torque technique of a dynamic control of a robot.