Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VI SEMESTER B.TECH MECHATRONICS ENGINEERING

END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: INDUSTRIAL ROBOTICS [MME 316]

Time: 3 Hours **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A. At time t, the excitation voltage to a resolver is 24 volts. The shaft angle is 180˚. What is the output signal from the resolver? **(02)**

1B. Define an industrial robot as per RIA? With the help of graph, discuss the relationship of fixed, programmable and flexible automation as a function of production volume and product variety. **(05)**

1C. Discuss the various drive methods used for robot gripping system. **(03)**

2A. One axis of a robot is a linear slide with a total range of 36inch. The robot's control memory has 10-bit capacity. It is assumed that the mechanical errors associated with the arm are normally distributed with a mean at the given taught point and an isotropic standard deviation of 0.10mm. Determine:

a) The control resolution for the axis under consideration.
b) The special resolution for the axis.
c) The defined accuracy.
d) The repeatability. **(04)**

2B. Explain the variations of light intensity with the help of graph, for Incandescent bulb and fluorescent bulb as an interference light source. **(03)**

2C. Identify likely sources of robot control system malfunction and suggest how they may be reduced or eliminated. **(03)**

3A. Distinguish between tactile and non-tactile group of sensors. State three types of sensors for each group. **(03)**

3B. Your department is operating a new robotics laboratory, prepare the jointed notation scheme and work volume of the robot with the help of a neat sketch. **(03)**

3C. List the safety guidelines to be implemented while installing a robot in the industry. **(04)**

4A. A round plate capacitor of diameter 40mm, switching point for axially approaching target is S_1 = 20mm and the switch hysteresis is 1mm. The switch point for target moving away is then $S_2 = S_1 + h$. Determine the change in capacitance.

Take $\varepsilon_r = 1$, $\varepsilon_o = 8.854 \times 10^{-12}$ F/m. **(03)**

4B. What is the added advantage of using three finger grippers over two finger grippers? List their suitable applications. **(03)**

4C. Discuss four ways in which planned labor rationalization could be accomplished in order to facilitate robotisation programme. **(04)**

5A. List the different internal and external sensors that can be used to design a robot arm. **(02)**

5B. Explain the characteristics of future robot tasks. **(03)**

5C. What do you mean by image segmentation? Explain different segmentation techniques. **(05)**

6A. What is the resolution of an absolute optical encoder that has six tracks? Nine tracks? Twelve tracks? **(03)**

6B. Robots are employed in a wide assortment of applications in manufacturing industries. State their applications. **(03)**

6C. NACHI Robotic Systems Inc. decided to install photoelectric sensor for their automobile parking system to count the number of automobiles parked. The sensors will be installed at the entrance and exit of the parking. The transmitter and receiver are on the opposite sides. The range of the sensor should be high and the output should be a digital value.

i. Determine the operating mode of the sensor.
ii. Under what circumstances reliable detection occurs?
iii. Draw and explain the typical output configuration of the operating mode. **(04)**