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MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University, Manipal – 576 104

I SEM. M-Tech. INDUSTRIAL AUTOMATION AND ROBOTICS PG DEGREE
END SEMESTER MAKEUP EXAMINATIONS
DEC 2015 - JAN 2016

SUBJECT: INTRODUCTION TO INDUSTRIAL ROBOTS (MTE 503)

Time: 3 Hours. MAX.MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVEFULL** questions.
- Any missing data can be assumed suitably.

1A) What kind of gripper is used for separating sheets of papers in printing industry? Show the application graphically and explain the principle involved. **(04)**

1B) Outline an application were through beam light sensors are specifically used. **(02)**

1C) Show and describe point to point control and continuous position control systems of robots. Give two applications for each. **(04)**

2A) Compare magnetic and inductive sensors principle of operation. **(03)**

2B) State and show various robot arm configurations. Also sketch different kinds of joints used in these configurations by line diagrams. **(05)**

2C) Outline a procedure of programming a de-burring robot with teach pendant. **(02)**

3A) Describe the power transmission system which can produce highest gear reduction. **(03)**

3B) In a robot slide mechanism of 0.9m length. The mechanical accuracy associated with the moving arm is a random variable with standard deviation of 0.2mm. Determine control resolution, spatial resolution, accuracy (in terms of C.R) and repeatability for both 8 bit and 12 bit control memory capacity. **(04)**

3C) Discuss force sensing system which can be embedded in a robotic gripper. **(03)**

4A) Explain the various illumination techniques used in robot vision system. **(04)**

4B) With calculations show how ultrasonic sensor can be used as a distance sensor **(04)**

4C) Outline a robotic wrist mechanism which can produce Pitch, Yaw and Roll motion. **(02)**

5A) Compare hydraulic and electric type rotary actuators. Give two applications for each. **(04)**

5B) Briefly explain the following terms with respect to robotic arm: **(02)**

a) Compliance

b) Speed of movement

5C) What is PWM explain its application in controlling a DC motor . **(04)**

6A) List and explain some features of future robots with respect to vision and tactile sensing capabilities. **(04)**

6B) Explain the three different operating conditions of ultrasonic sensors. **(03)**

6C) What are codes of practice? Clarify any two codes relevant to robots. **(03)**