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Roll No. .....

22225

M. Tech. Ist Sem. Mechanical Engg.

(Machine Design)

Examination – December, 2013

MECHATRONICS AND PRODUCT DESIGN

Paper : M-809-A

Time : Three hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Answer any *five* questions.

1. (a) What are the key elements of Mechatronics system ? Explain with example. 10

(b) Device a pick and place robot system explaining

3. (a) Discuss the static and dynamic characteristics of sensors. 10

(b) What is RTD ? Briefly explain the relationship between resistance and temperature for the RTD with temperature resistance curve. 10

4. (a) Write short notes on the following : 10

(i) Self-excited wound field shunt configuration dc motor.

(ii) Self-excited wound field series configuration dc motor.

(iii) Stepper motor.

(iv) Induction motor.

(b) Draw the circuit of a counter type A/D converter and explain its operation. 10

5. (a) What is the output of a system with transfer function $s/(s+3)^2$ and subject to a unit impulse ? 10

(b) A feedback control system has transfer function of

6. (a) Discuss briefly the various thermal systems building blocks. 10

(b) A hot object, capacitance C and temperature T, cools in a large room at temperature T_r. If the thermal system has a resistance R. Derive an equation describing how the temperature of the hot object changes with time and give an electrical analogue of the system. 10

7. (a) Write short notes on encoders and decoders. 10

(b) What are the various sensors and actuators used in CNC machines ? Explain their working in CNC machines. 10

8. (a) Explain the Mechatronics systems used in an automatic camera with a neat block diagram. 10

(b) Explain briefly a mathematical model of a car moving on a road. 10