Second Semester M.Tech. Degree Examination, June / July 2014
Mechatronics System Design

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1   a. With suitable example, explain working of basic elements of a closed loop control system.
                 (10 Marks)
   b. What are microprocessors based controllers? Explain mechatronics approach for car management system.   **(10 Marks)**

2   a. Explain with suitable circuit how following sequence of two pneumatic cylinders can be achieved:
     A^+, B^+, A^-, B^- **(10 Marks)**
   b. Discuss general specifications of stepper motor and explain different forms of stepper motor.
                 (10 Marks)

3   a. With suitable equations, mention the building blocks of mechanical system models.
                 (05 Marks)
   b. Build basic system model for following situation:
     i) A machine mounted on ground.
     ii) A wheel of a car moving along a road.   **(07 Marks)**
   c. With suitable illustrations explain the basic fluid system building blocks of system modeling.   **(08 Marks)**

4   a. Define MEMS and microsystem and illustrate with sketch configuration of intelligent micro system.   **(06 Marks)**
   b. Explain working of micropressure pressure sensor which uses capacitance signal transduction.   **(06 Marks)**
   c. Discuss briefly the application of microsystem in automobile.   **(08 Marks)**

5   a. Explain with suitable sketches the working of following i) Micro pump   ii) Micro accelerometer.   **(10 Marks)**
   b. Discuss why silicon is an ideal substrate for MEMS.   **(05 Marks)**
   c. Briefly explain the different silicon compounds used in micro system.   **(05 Marks)**

6   a. Explain with suitable sketch general procedure of photo lithography.   **(08 Marks)**
   b. Discuss briefly the procedure of ion-implantation as a microfabrication process.   **(06 Marks)**
   c. List the methods available for epitaxial deposition and explain any one.   **(06 Marks)**

7   a. Write an explanatory note on LIGA process used for micromanufacturing of MEMS.
                 (10 Marks)
   b. What are the fault finding techniques used with microprocessor based system? Explain.
                 (10 Marks)

8   a. What are the benefits of designing smaller components in a system?   **(05 Marks)**
   b. Explain working principles of chemical sensor.   **(05 Marks)**
   c. Discuss the properties of Gallium Arsenide as material for MEMS and microsystem.
                 (05 Marks)
   d. Explain briefly the typical faults that occur in microprocessor system.   **(05 Marks)**

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