Code No: 07A71401   **R07**   **Set No. 2**

IV B.Tech I Semester Examinations,MAY 2011
MOTION CONTROL DESIGN
Mechatronics

Time: 3 hours   **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Explain about forward biasing and reverse biasing in semiconducting devices.

   (b) Describe NPN transistor with a neat sketch.   [8+8]

2. Define rotation transformation and explain how to represent the transformation for rotation of an angle θ about X, Y and Z-axis.   [16]

3. Describe any three types of air compressors used in pneumatic system.   [16]

4. (a) Describe various types of flow control valves used in hydraulic system.

   (b) Explain the different operating methods used to actuate direction control valves in hydraulic systems.   [8+8]

5. (a) Discuss role of motion control mechanisms used in machine tools.

   (b) Discuss role of mechatronics in motion control devices.   [8+8]

6. (a) Describe "NOT" and "NOR" logic gates used in PLC programming and draw their truth table.

   (b) Explain the features of PLCs used in control circuits.   [8+8]

7. (a) Describe the advantages of compound gear train over open belt drive system.

   (b) In a reverted epicyclic gear train the arm A carries two gears B and C and a compound gear D-E. the gear B meshes with gear E and the gear C meshes with gear D. the number of teeth on gear B, C, and D are 80,40 and 100 respectively. Find the speed and direction of gear C when the gear B is fixed and the arm A makes 150 rpm clockwise.   [6+10]

8. (a) Describe various types of sensors used in detecting the speed of the electric motor.

   (b) Explain the use of stepper motors used in motion control systems.   [8+8]

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Code No: 07A71401 | R07 | | Set No. 4 |

IV B.Tech I Semester Examinations,MAY 2011
MOTION CONTROL DESIGN
Mechatronics

Time: 3 hours   Max Marks: 80
Answer any FIVE Questions
All Questions carry equal marks
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1. Draw the Air line installation circuit used in pneumatic systems and describe the components used in Air line installation circuit.   [16]

2. (a) What are the advantages of timing belt systems for power transmission over them.

   (b) How does helical gear differ from spur gear system? Mention their advantages.
                                                                       [8+8]

3. (a) Describe various types of automation used in manufacturing industries.

   (b) State advantages and limitations of automation in industries.   [8+8]

4. Explain the following with their applications.

   (a) Slew motion.

   (b) Joint integrated motion.

   (c) Straight line motion.   [16]

5. Describe the operation of Half - Step Stepper motor with a neat Sketch.   [16]

6. Draw a circuit diagram to control and operate hydraulic acting cylinder using 4/3 Direction control valve (manual control) and explain the principle of working of the Components of the system.   [16]

7. (a) Describe the features of programmable logic controllers in comparison to computers.

   (b) Write the differences between a Microprocessor and PLC.   [8+8]

8. (a) List out the characteristics of semiconducting materials.

   (b) Explain about potential barrier and biasing in semiconducting materials. [8+8]

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Code No: 07A71401 | **R07** | **Set No. 1**

IV B.Tech I Semester Examinations,MAY 2011
MOTION CONTROL DESIGN
Mechatronics

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Explain the following:
    i. Euler angles.
    ii. RPY representation.
   (b) Find the D-H matrix for R-R manipulators. [8+8]

2. (a) Classify pumps used in Hydraulic systems mentioning their characteristics specific applications and limitations.
   (b) With the help of hydraulic circuit explain servo control systems used in machine tools. [8+8]

3. (a) Describe various types of control valves used in pneumatic system.
   (b) Write the advantages and disadvantages of air motors over an electric Motor. [8+8]

4. (a) Write the advantages of Stepper motors over Electric motors.
   (b) Describe Optical Incremental encoders used in DC brushless servo motors. [16]

5. (a) Explain the use of idler pulley in belt drives with their advantages.
   (b) A shaft which rotates at a constant speed of 160 rpm is connected by belt to a parallel shaft 720 mm apart, which has to run at 60, 80 and 100 rpm. The smallest pulley on the driving shaft is 40 mm radius. Determine the remaining radii of the two stepped pulleys for
    i. A crossed belt and
    ii. An open belt. Neglect belt thickness and slip. [6+10]

6. (a) Describe cut-off region, active region and saturation region in bipolar junction transistor.
   (b) Describe PNP transistor with a neat sketch. [8+8]

7. (a) Discuss the factor considered for selection of automation system for a particular industry.
   (b) Describe the working principle of an electric motor with a neat sketch. [8+8]

8. Write short notes on:
   (a) PLC and

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(b) ON/OFF controller.   [8+8]

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FIRSTRANKER

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| R07 | Set No. 3

IV B.Tech I Semester Examinations,MAY 2011
MOTION CONTROL DESIGN
Mechatronics

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. Differentiate between N- type and P- type semiconducting materials with examples.
   [16]

2. (a) Classify various hydraulic control valves and their principle and specific applications in industrial hydraulics.

   (b) Discuss operation of Electro-Hydraulic actuator used in machine tools with the help of neat diagram.   [8+8]

3. Write short notes on:

   (a) Open loop control systems.

   (b) Fuzzy logic system.   [8+8]

4. (a) Write the characteristics, Limitations and applications of hydraulic actuators and mechanical actuators.

   (b) Explain the working of Non-return valve used in hydraulic circuit with a neat sketch.

   [8+8]

5. (a) Describe the construction of various types of belts used in power transmission.

   (b) The power is transmitted from a pulley 1 m diameter running at 200 rpm to a pulley 2.25 m diameter by means of a belt. Find the speed lost by the driven pulley as a result of creep, if the stress on the tight and slack side of the belt is 1.4Mpa and 0.5 MPa respectively. The Young's modulus of the material of the belt is 100 MPa.

   [6+10]

6. (a) Explain various servo control systems with their industrial applications.

   (b) Describe a DC Servo Motor with a neat sketch.   [8+8]

7. What is meant by a fluidic element? Discuss different types of fluidic elements used in pneumatic elements.   [16]

8. Define joint vector and explain how position of a manipulator is represented for a 5R-1P manipulator.   [16]

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