

M.E. Second Semester (Mechanical Engineering (Adv. Manu. & Mech. Sys. Desig.)) (New - CGS)
13471 : Mechatronics in System Design : 2 MMD 3

P. Pages : 2

Time : Three Hours



AU - 3389

Max. Marks : 80

- Notes :
1. Answer **three** question from Section A and **three** question from Section B.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answer necessary with the help of neat sketches.

SECTION – A

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|----|----|---|---|
| 1. | a) | Define mechatronics concept. Taking washing machine as an example of a mechatronic system, explain different mechatronic elements involved in it. | 7 |
| | b) | What is sampling, quantization, resolution, and quantization error in signal conditioning? Explain with the help of a neat diagram. | 7 |
| 2. | a) | What are different types position sensors? Explain an LVDT as a position sensor. | 7 |
| | b) | How an analog signal is converted into its digital counterpart using successive approximation method? | 6 |
| 3. | a) | What is the role of an encoder in a CNC machine? Explain GRAY encoder disc for a rotary encoder with least count of 45°. | 7 |
| | b) | What is the concept of unipolar half step phase sequencing in a stepper motor? | 6 |
| 4. | a) | Explain the velocity loop for a servomotor mechanism. | 7 |
| | b) | How to synchronise two pneumatic cylinders? | 6 |
| 5. | a) | Design and explain the pneumatic circuit is used for operating a double acting pneumatic cylinder. | 7 |
| | b) | Explain travel dependent pneumatic circuit for sequencing two pneumatic cylinders. | 6 |

SECTION – B

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|----|----|---|---|
| 6. | a) | Two cylinders are used to push a heavy work piece which is placed on a work table the motions of the two hydraulic cylinders have to be in synchronization. Draw and explain the circuit. | 7 |
| | b) | Explain, braking and replenishing circuit for a high speed hydraulic motor. | 6 |
| 7. | a) | Design and explain the working of a pressure dependent sequencing circuit for sequencing two hydraulic cylinders. | 7 |
| | b) | What are the advantages and disadvantages of hydraulic circuits. | 6 |

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|-----|----|---|---|
| 8. | a) | Draw and explain the continuous reciprocation hydraulic circuit for reciprocating table of a surface grinder. | 7 |
| | b) | Draw and explain quick return motion hydraulic circuit. | 6 |
| 9. | a) | With the help of a block diagram explain the working of a microcontroller. | 7 |
| | b) | What are the distinguishing features of a PLC over wired relay logic circuit? | 6 |
| 10. | a) | What are the conversions followed in ladder logic diagrams? | 7 |
| | b) | Prepare a ladder logic program for automatically infusing the container with liquids A & B in order when START button is pressed. When it reaches the set level, mix the two liquids evenly with the help of a motor stirrer then open the valve to let out the mixture. Draw the figure and show the positions of the sensors/actuators. | 7 |
