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16301(D) - 0 DEC 2016

B. Tech 8th Semester Examination

Mechatronics (NS)

ME-424

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one question each from Sections A, B, C & D of the paper and all sub-parts of Question No. 9 of Section E.

SECTION - A

1. (a) What is mechatronics? Draw a block diagram of general mechatronics systems. Explain the function of each block. (12)

   (b) Define the term standard and explain its importance in mechatronics system. What are primary, secondary and working standards? (8)

2. (a) List out the merits and demerits in reference to open and closed loop control systems. (12)

   (b) What do you mean by sequential control and illustrate your answer by an example. (8)

SECTION - B

3. Suggest the elements that might be considered for the mechatronics systems to be used to: (a) Monitor the pressure in an air pressure line and present the result on a dial, no great

accuracy being required, (b) Monitor continuously and record the temperature of a room with an accuracy of ± 1°C, (c) Monitor the weight of lorries passing over a weighing platform and (d) Monitor the angular speed of rotation of a shaft. (20)

4. Suggest a sensor that could be used as part of a control system for a furnace to monitor the rate at which the heating oil flows along a pipe. The output from the measurement system is to be an electrical signal which can be used to adjust the speed of the oil pump. The system must be capable of operating continuously and automatically, without adjustment, for long periods of time. (20)

SECTION - C

5. (a) Device a system, using a PLC, which can be used to control the movement of a piston in a cylinder so that when a switch is momentarily pressed, the piston moves in one direction and when a second switch is momentarily pressed, the piston moves in the other direction. (10)

   (b) Explain what logic gates might be used to control the following situations: (i) The issue of tickets at an automatic ticket machine at a railway station, and (ii) A safety lock system for the operation of a machine tool. (10)

6. (a) Input A is applied directly to a two-input AND gate. Input B is applied to a NOT gate and then to the AND gate. What condition of inputs A and B will result in a 1 output from the AND gate? (6)

   (b) Draw the Karnaugh maps for the following truth table (Table 1) and hence determine the simplified Boolean equation for the outputs:

Table 1: Truth table

A	B	C	Q
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

(14)

SECTION - D

7. (a) What is the role of accumulator, status, memory address and program counter registers in case of microprocessor? (15)

   (b) Describe the functions that can be required of an interface. (5)

8. (a) Suggest some mechatronics design solution for wind screen wiper motion. Also draw a neat sketch showing all the functional elements used in this measurement system arrangement. (10)

   (b) Draw a block diagram of a basic microcontroller and explain the function of each system. (10)

SECTION - E (Compulsory Question)

9. Write short notes on the following:

   (a) Analogue and digital control system.

   (b) Show the logic arrangements for implementing: "OR" operation using "NOR" elements.

   (c) Explain how a PLC can be used to handle an analogue input.

   (d) Mechanical design solution for bar code recorder.

   (e) Data acquisition system. (4×5=20)