



# CBCS SCHEME

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18MT752

## Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024 Mechatronics System Design

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- Define Mechatronics. Explain the key elements of Mechatronics systems. (10 Marks)
  - Explain the design process of Mechatronics system. (10 Marks)

OR

- Briefly explain the application areas of mechatronics. (10 Marks)
  - Explain the integrated issues in mechatronics. (10 Marks)

### Module-2

- Compute the loop transfer function, LTF, the closed-loop transfer function, CLTF and the return difference, RD for the following diagrams. (10 Marks)

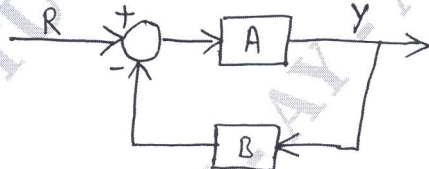


Fig.Q.3(a)(i)

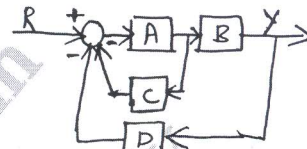


Fig.Q.3(a)(ii)

- Use block diagram manipulations to compute the transfer functions for the following block diagram. (10 Marks)

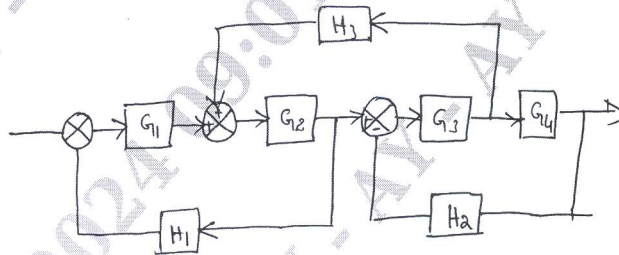


Fig.Q.3(b)

OR

- Compute the block diagram representation for the following mechanical circuit. (20 Marks)

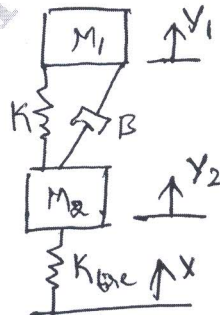


Fig.Q.4

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 a. With block diagram explain fluid power design elements. (10 Marks)  
 b. Explain Energy Modulation Devices (valves) with diagram. (10 Marks)

**OR**

- 6 a. Explain the different control modes of fluid power circuits. (10 Marks)  
 b. Write a short note on:  
 i) Linearization of Non-linear systems  
 ii) Piezoelectric actuators. (10 Marks)

**Module-4**

- 7 a. Solve  $Y(S) = \frac{1}{(S+2)^3(S+3)}$  for  $y(t)$ . (15 Marks)  
 b. Explain the elements of data acquisition system. (05 Marks)

**OR**

- 8 a. A lag compensator is designed to modify the behavior of the plant  
 $G_x(S) = \frac{1}{(S+1)(S^2+2S+2)}$  such that the following performance specifications are met,  
 i)  $e_{ss}(\text{step}) \leq 0.05$  ii) Determine that the system is stable. (15 Marks)  
 b. Explain the different measures system performance. (05 Marks)

**Module-5**

- 9 a. Explain position control of a permanent magnet DC gear motor. (10 Marks)  
 b. Explain transducer calibration system for automotive application. (10 Marks)

**OR**

- 10 a. What is mass-spring oscillation and damping? Explain with an example of mechatronics technology demonstration. (10 Marks)  
 b. Explain auto control system for green house temperature. (10 Marks)

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