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**UNIVERSITY OF PETROLEUM
AND ENERGY STUDIES**



End Semester Examination – December, 2017

Program/course: B.Tech/Mechatronics

Semester –7th

Subject: Mechatronics System Design

Max. Marks : 100

Code : MEEL401

Duration : 3 Hrs

No. of page/s:3

Section A

Attempt all the questions. Each question carries 5 Marks.

1. Explain the term mechatronics system design. How it different from the traditional approach of designing . State the advantage of using the mechatronics design methodology.
2. Explain the function of a sensor and a actuator in a mechatronics system. List different type of actuators with at least two example of each type.
3. Understand the purpose of the following mechatronics system and recommended appropriate sensor and actuator to carry out the specified task.
 - (a) Temperature control system
Purpose: To maintain the temperature of a confined space at the specified temperature.
 - (b) Anti-Lock Braking system
Purpose: To prevent wheels from locking by automatically modulating the brake pressure during an emergency stop.
4. Explain the integrated design issues in mechatronics.

Section B

Attempt all the questions. Each question carries 10 Marks.

5. Prove that the controller shown in figure1 is of PI type, relating output motion 'z' and input motion 'x'. Further, motion of sleeve may be assumed as 'y'
Spring coefficient =k, Viscous damping coefficient =C other parameters are shown in the figure.
Proportional constant of the controller is 'K' and $k/c = K_i$, the integral constant.

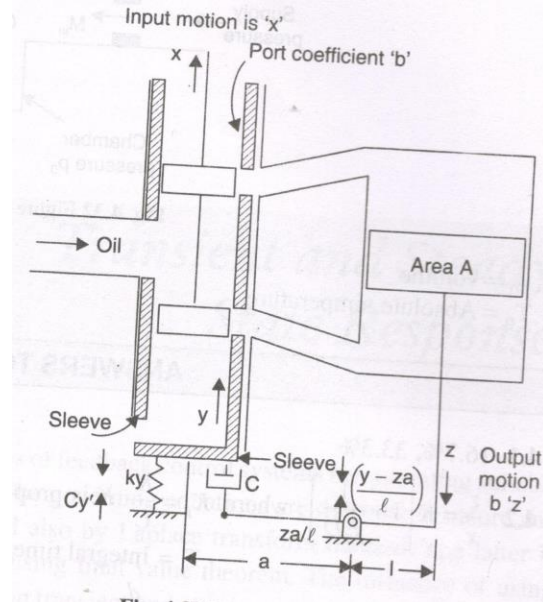


Figure1

6. Find the expression for the Operational amplifier of figure2 is of differential type, $e_2(t)$ is the output voltage and $e_1(t)$ is the input voltage . i_1, i_2, i_3 are currents as shown in figure2.

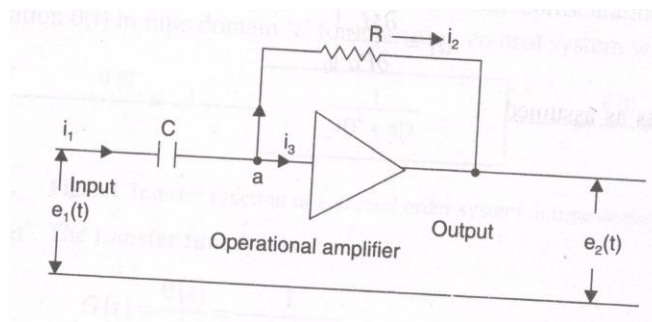


Figure2

7. Explain the hardware in the loop simulation.
8. Explain the application in mechatronics of condition monitoring .

OR

Explain the term interactive modeling

Section C

Attempt all the questions. Each question carries 20 Marks.

9. Derive the expression for transfer function y/x for the hydraulic system shown in figure 3 and find the conditions for which it can act as a PID controller

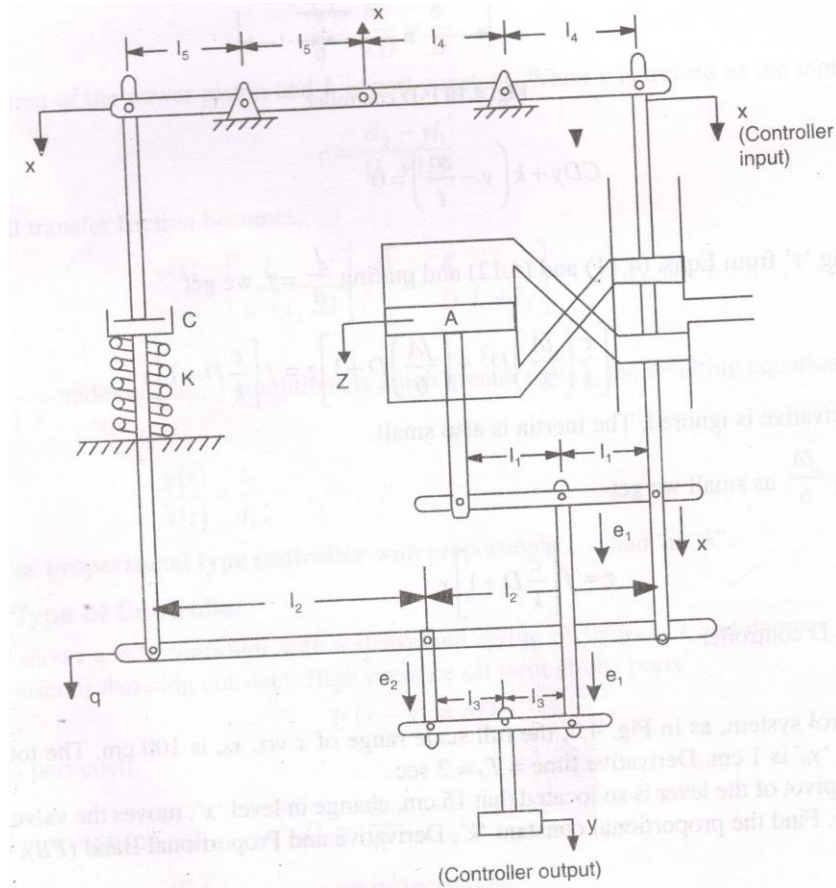


Figure3

10. (a) Explain the active vibration control system.
 (b) Explain the solid flow measurement device.

OR

Explain the internal structure of piezoelectric accelerometer.