

Total No. of Questions : 8]

SEAT No. :

P7659

[Total No. of Pages : 3

[6180]-181

T.E. (Mechanical) (Mechanical Sandwich)

MECHATRONICS

(2019 Pattern) (Semester-I) (302044)

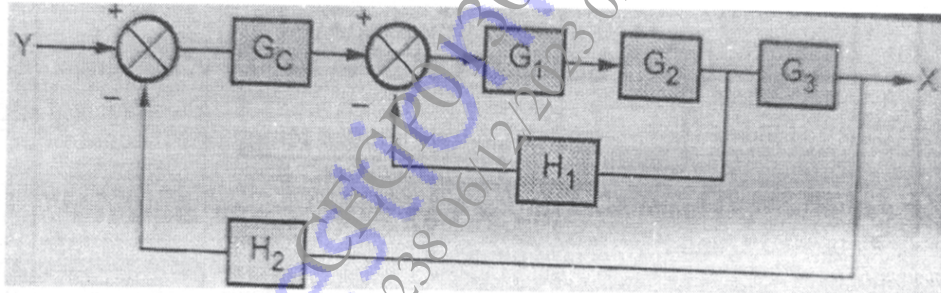
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

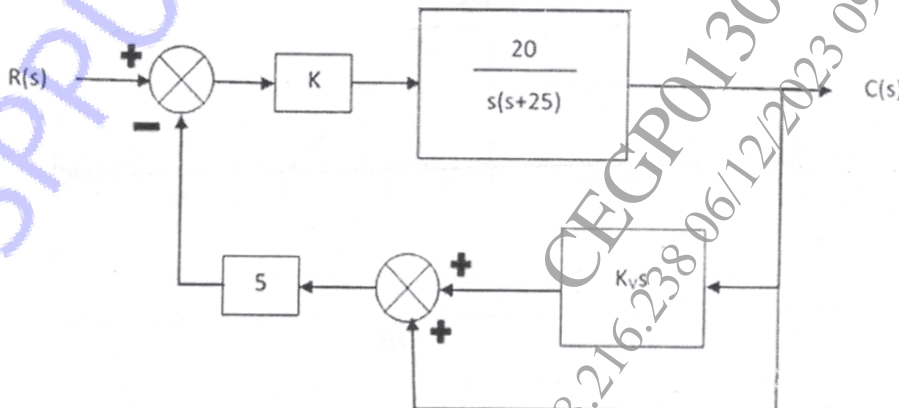
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Use of drawing instruments, electronic pocket calculators are allowed.
- 3) Figures to the right indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1) a) Explain closed loop control system with an example. [5]
b) Explain application of mechatronics. Engine management system [5]
c) Reduce the block diagram and find the transfer function of the following Figure. [8]



OR

- Q2) a) Explain concept of transfer function and state its properties. [5]
b) Explain dish washer as an application of mechatronics system. [5]
c) [8]



P.T.O.

- Q3) a)** Compare time response and frequency response analysis [5]
b) Explain Bode plot and its advantages. [5]

c) For the system with transfer function $\frac{1}{(s + 2 + 7j)(s + 2 - 7j)}$. Draw the pole and zero plot and find damping ratio, natural frequency, peak time, maximum overshoot. [7]

OR

Q4) a) Explain frequency response specifications such as resonant peak, resonant frequency, band width [5]

b) Explain gain margin and phase margin [5]

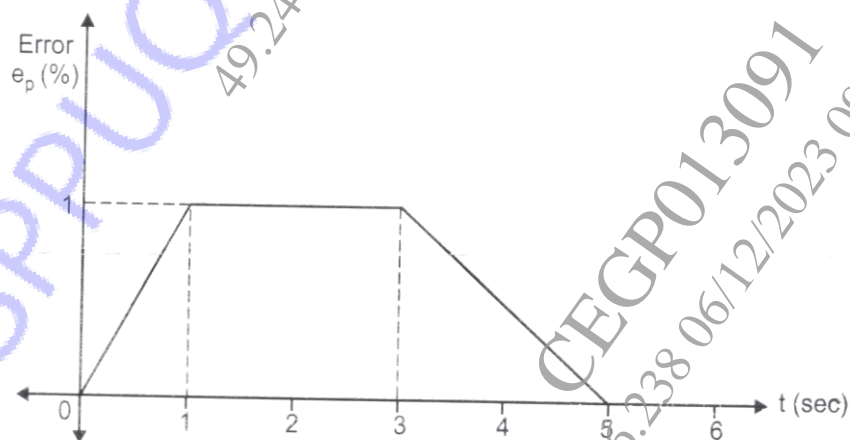
c) $\frac{C(s)}{R(s)} = \frac{0.5s + 2}{s^2 + 0.5s + 2}$ For the transfer function of second order system presented by above equation, determine [7]

- location of poles and zeros
- damping factor
- comment of stability

Q5) a) Explain the Proportional Integral controller with a block diagram. [5]

b) How Zeigler Nichols method is useful in the tuning of PID controller?[5]

c) Draw the PD controller response for the given error graph as shown in Fig. $K_p = 5$, $K_D = 0.5$ s, and $P_o = 20\%$. [8]



OR

- Q6)** a) Using a suitable block diagram explain the working of PID control in parallel form. [5]
- b) Explain the advantages of an integral controller over a proportional controller. [5]
- c) A derivative controller has initial, controller output $P_0=55\%$ and derivative constant $K_D = 0.5\% - \text{sec}/\%$. What will be the controller output, when the error.
- i) Change at $1.5\% \text{ sec}$.
- ii) Is constant at 4% .

- Q7)** a) State the different areas of application of PLC. [5]
- b) Using a suitable diagram explain the working of the counter in a PLC. [5]
- c) In a certain bank, each of the three bank officers has a unique key to the vault. The bank rules require that two out of the three officers be present when the vault is opened. Draw the ladder diagram for a relay logic circuit that will unlatch the door and turn on the light when two of the three keys are inserted. [7]

OR

- Q8)** a) State the advantages of PLC over the relay system. [5]
- b) Explain the basic components of PLC. [5]
- c) Draw the ladder diagram for the following conditions: [7]
- i) When the start push button is pressed motor M1 and M2 turns ON simultaneously.
- ii) If anyone's motor out of M1 and M2 is OFF motor M3 is turned ON immediately.
- iii) When the stop push button is pressed whole systems turn OFF.

