Total No. of Questions : 8]

SEAT No. :

P7659

[Total No. of Pages : 3

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T.E. (Mechanical) (Mechanical Sandwich)

MECHATRONICS

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

Time : 2½ Hours] *[Max. Marks : 70*

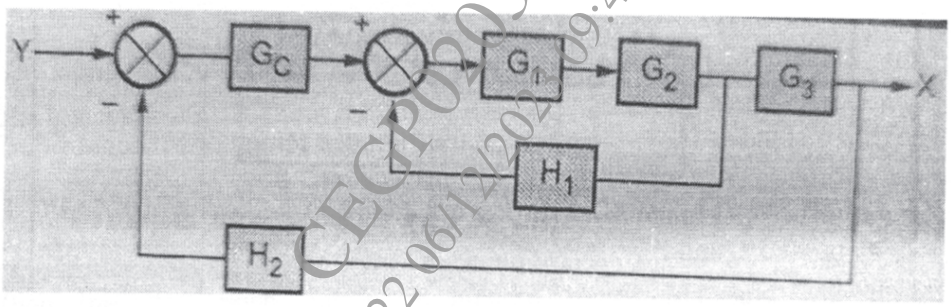
Instructions to the candidates:

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]**

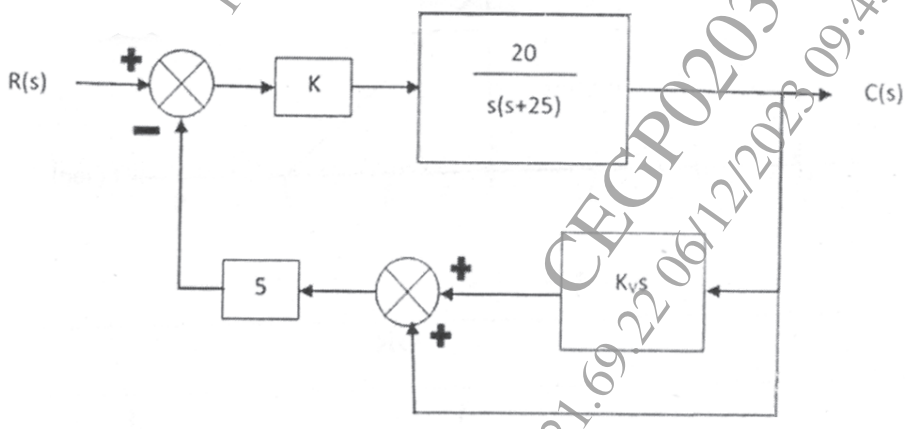


OR

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]**



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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]**

i) location of poles and zeros

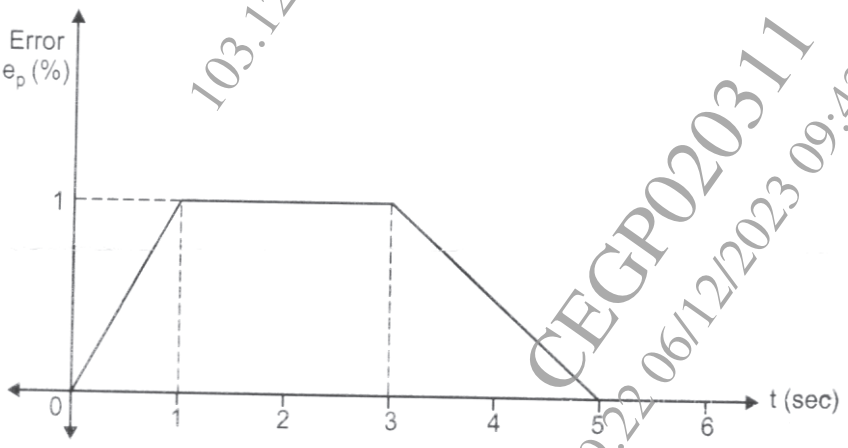
ii) damping factor

iii) 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

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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 Po=55% and derivative constant K_D = 0.5% – sec/%. What will be the controller output, when the error. **[8]**

i) Change at 1.5% 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.

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