Total No. of Questions :12]

SEAT No. :

P2917

[Total No. of Pages :4

[4958] - 151

T.E. (Electronics)

FEEDBACK CONTROL SYSTEMS

(Semester - I) (2008 Course) (304201)

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

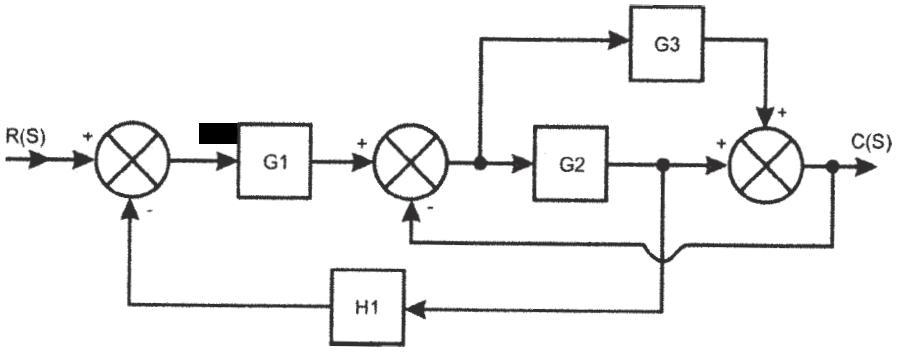
Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Explain with neat diagram and waveform working principle of synchro error detector. **[8]**

b) Reduce the block diagram to its Canonical form and obtain $\frac{C(s)}{R(s)}$. **[8]**

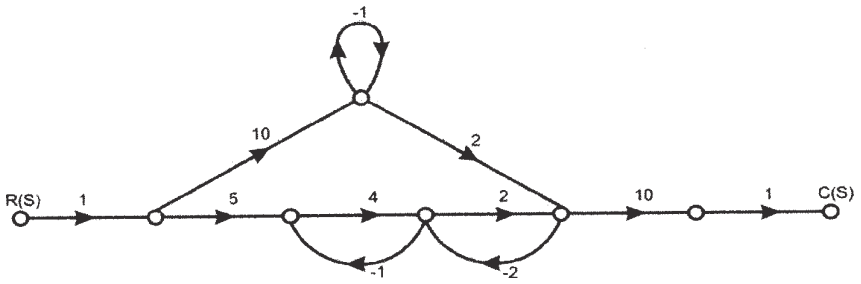


OR

P.T.O.

Q2) a) Represent the armature controlled DC motor with a block diagram and derive its transfer function. **[8]**

b) Find $\frac{C(s)}{R(s)}$ by using Mason's gain formula. **[8]**



Q3) a) Derive the value of static error constant and steady state error for. **[8]**

i) Type 0 systems.

ii) Type 1 system.

iii) Type 2 systems.

b) A unity feedback system has $G(s) = \frac{K}{s(s+10)(s^2+4s+5)}$ Determine the range of K for closed loop system to be stable. **[8]**

OR

Q4) a) Sketch the root locus for system with **[10]**

$$G(s).H(s) = \frac{K(s+4)}{s(s^2+6s+13)}.$$

b) A second order system is given by $\frac{C(s)}{R(s)} = \frac{25}{s^2+6s+25}$ find it's rise time, peak time, peak overshoot and settling time if subjected to unit step input also calculate expression for its output response. **[6]**

Q5) a) A Unity feedback control system has $G(s) = \frac{40(s+5)}{s(s+10)(s+2)}$ Draw Bode plot. Determine G_M, P_M, ω_{gc}, ω_{pc}. Comment on the stability of the system. **[12]**

b) State and explain "Mapping theorem". **[6]**

OR

Q6) a) Sketch the Nyquist plot for the system with open loop Transfer function $G(s).H(s) = \frac{k}{s(s+2)(s+10)}$ and hence calculate the range of value of k for stability. **[12]**

b) Write a short note on correlation between time domain and frequency domain specification. **[6]**

SECTION - II

Q7) a) Obtain the state model of a field controlled DC servomotor. **[8]**

b) Consider the system having state model.

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-2 & -3\\ 4 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}3\\ 5\end{bmatrix}u \text{ and } y = \begin{bmatrix}1 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$ With D=0, obtain its Transfer function. **[8]**

OR

Q8) a) Find the state transition Matrix of the State Equation **[8]**

$$\begin{bmatrix}x_1\\ x_2\end{bmatrix} = \begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}1\\ 1\end{bmatrix}u$$

b) Find the Controllability and Observability of the State Model. **[8]**

$$A = \begin{bmatrix}-2 & 1\\ 1 & -2\end{bmatrix}, B = \begin{bmatrix}1\\ 0\end{bmatrix}, C = \begin{bmatrix}1 & -1\end{bmatrix}.$$

Q9) a) What are thermistors? Explain their construction. Write advantages & limitation of Thermistor. **[8]**

b) Define the following: **[8]**

i) Proportional band.

ii) Integral gain.

iii) Derivative gain.

iv) Offset.

OR

Q10)a) Draw the PLC Ladder Diagram for "Conveyer system for bottle filling "consider all sensors are direct inputs to PLC. **[8]**

b) Draw & Explain response of PID controller for **[8]**

i) Unit step input.

ii) Unit ramp input.

Q11)a) Explain how fuzzy logic control scheme can be applied for temperature control of process. **[8]**

b) Draw a generator block schematic of a fuzzy controller and Explain the function of each block. **[6]**

c) What do you understand by the term "adaptive fuzzy system". **[4]**

OR

Q12)a) Explain with neat diagram of the biological and Artificial neuron models. **[8]**

b) Explain the following terms w.r.t. Neural network. **[6]**

i) Supervised learning.

ii) Unsupervised learning.

c) What are advantages of fuzzy controller over conventional PID controller? **[4]**