

[4858] - 151

T.E. (Electronics)

FEEDBACK CONTROL SYSTEM

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

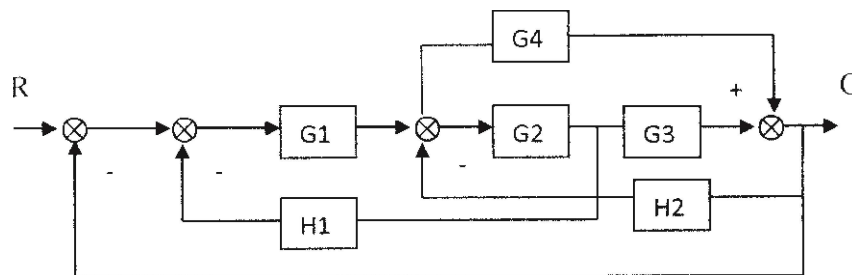
- 1) *Answers to the two sections should be written in separate books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to be right side indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of logarithmic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

SECTION - I

Q1) a) Identify the following system as open loop or closed loop and justify. [8]

- i) Home heating system. ii) Traffic light controller.

b) Determine transfer function $C(S)/R(S)$ for given diagram. [8]

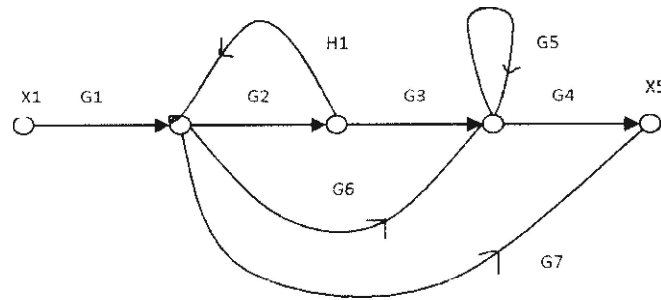


OR

Q2) a) Comparing between Armature controlled and field controlled DC servomotors. [8]

P.T.O.

- b) Determine the ratio of X_5/X_1 . Use Mason's gain formula for signal flow graph. [8]



- Q3)** a) Find K_p , K_v , K_a and steady state error for a system with open loop transfer function. [8]

$$G(s)H(s) = \frac{10(s+3)(s+4)}{s(s+1)(s+2)(s+5)}$$

Where input is

$$r(t) = 3 + t + t^2$$

- b) For unity feedback system, (Using Routh's Criteria) [8]

$$G(s) = \frac{k}{s(1 + 0.4s)(1 + 0.25s)}$$

Find

- Range of values of K
- Marginal value of K
- Frequency of sustain oscillation
- Comment of stability

OR

- Q4)** Draw the root locus of the following system and find stability. [16]

$$G(s) = \frac{k(s+5)}{(s^2 + 5s + 6)}$$

Q5) a) Derive the expression for the bandwidth of a standard second order system in frequency domain. [8]

b) A unity feedback control system has [10]

$$G(s) = \frac{80}{s(s+2)(s+20)}$$

Draw the bode plot and determine G.M, P.M., ω_{gc} , ω_{pc} and comment on stability.

OR

Q6) a) The open loop transfer function of a certain control system is [10]

$$G(s)H(s) = \frac{10(1+T_1 s)}{s^2(1+T_2 s)}$$

Sketch the nyquist plot for

i) $T_1 > T_2$

ii) $T_2 > T_1$

iii) $T_1 = T_2$

b) Classify compensation techniques and explain any one in detailed. [8]

SECTION - II

Q7) a) Evaluate the observability of the system with kalman's test. [10]

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \quad \text{and} \quad C = [3 \quad 4 \quad 1]$$

b) Find state transition matrix for : [8]

$$A = \begin{bmatrix} 1 & -2 \\ 3 & -4 \end{bmatrix}$$

OR

Q8) a) Obtain state space model using with transfer function. [6]

$$\frac{Y(s)}{U(s)} = \frac{1}{(s^2 + 5s + 6)}$$

b) Define the terms for second order system : [12]

- | | |
|---------------------|---------------------|
| i) State | ii) State variables |
| iii) State space | iv) State vector |
| v) State trajectory | vi) State model |

Q9) a) Explain Piezoelectric Pressure Transducer. [8]

b) State PID control mode and state characteristics. [8]

OR

Q10) a) Explain PLC operating modes. [8]

b) Draw the ladder diagram for number of tank filling machine. [8]

Q11) a) Write note on : [8]

- i) Fuzzy operation
- ii) Fuzzy set and membership function

b) Explain fuzzification and defuzzification method. [8]

OR

Q12) a) Explain various types of neural network used in control system. [8]

b) Write note on : [8]

Artificial neural network.

