

CBCS SCHEME

USN

15ME73

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019 Control Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define control system. Explain open and closed loop control systems with examples. (08 Marks)
- b. With block diagram, explain:
 - i) Proportional controller
 - ii) Integral controller
 - iii) Proportional plus differential controller. (08 Marks)

OR

- 2 a. List the advantages and disadvantages of open loop and closed loop control system. (08 Marks)
- b. Explain requirements of automatic control system. (08 Marks)

Module-2

- 3 a. Obtain differential equation and hence get transfer function for mechanical system shown in Fig.Q.3(a). (08 Marks)

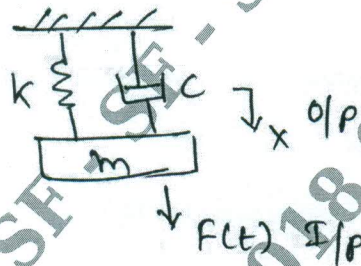


Fig.Q.3(a)

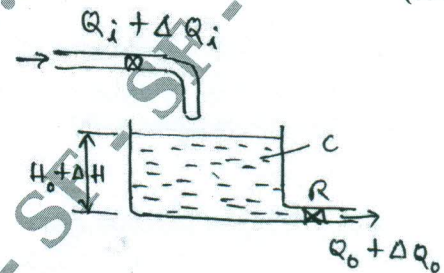
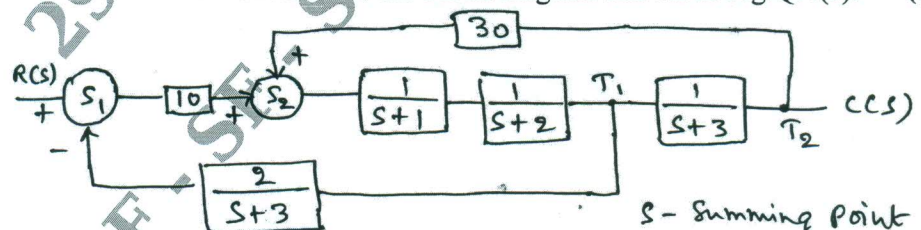


Fig.Q.3(b)

- b. Obtain transfer function of liquid level control system shown in Fig.Q.3(b). (08 Marks)

OR

- 4 a. Obtain the overall transfer function for the block diagram shown in Fig.Q.4(a). (08 Marks)



S - Summing point
T - Take off point

Fig.Q.4(a)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.



15ME73
(08 Marks)

- b. Find the transfer function for the signal flow graph shown in Fig.Q.4(b) by using Mason's gain formula.

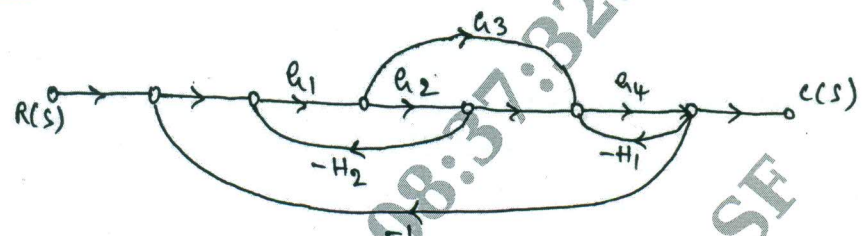


Fig.Q.4(b)

Module-3

- 5 a. A unity feed back system has $G(s) = \frac{40(s+2)}{s(s+1)(s+4)}$. Determine: i) Type of system
ii) All error coefficients iii) Error for ramp input with magnitude 4. (08 Marks)
b. The time response of a second order system for unit step input is $c(t) = 1 + 0.2e^{-60t} - 1.2e^{-10t}$. Determine: i) Closed-loop transfer function ii) Undamped natural frequency and damping ratio. (08 Marks)

OR

- 6 Sketch the root locus for the system with $G(s)H(s) = \frac{K(s+4)}{s(s^2+2s+2)}$. (16 Marks)

Module-4

- 7 Draw the Bode plot for a system having $G(s)H(s) = \frac{100}{s(s+1)(s+2)}$
Find: i) Gain margin ii) Phase margin iii) Gain crossover frequency
iv) Phase over frequency. (16 Marks)

OR

- 8 a. Draw the polar plot and ascertain the nature of stability for OLTF. $G(s)H(s) = \frac{12}{(s+1)(s+2)(s+3)}$. (08 Marks)
b. For a system with open loop T.F. $G(s)H(s) = \frac{1}{s(1+2s)(1+s)}$. Comment on stability of the system by Nyquist plot. Also find gain margin in dB. (08 Marks)

Module-5

- 9 a. Explain series and feed back compensation with block diagrams. (08 Marks)
b. Write note on gain and phase cross over frequency gain and phase margin in polar plot. (08 Marks)

OR

- 10 a. Define the terms: i) State ii) State variables iii) State vector iv) State space. (08 Marks)
b. Determine the state controllability and observability of the system described by

$$\dot{x} = \begin{bmatrix} -3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} x + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix} u \quad y = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} x$$

(08 Marks)