CBCS SCHEME

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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)**

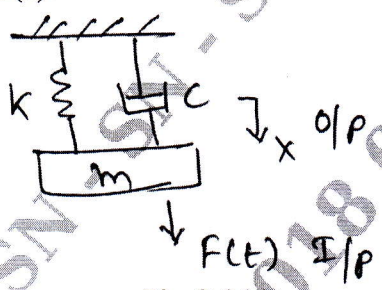

Fig.Q.3(a)

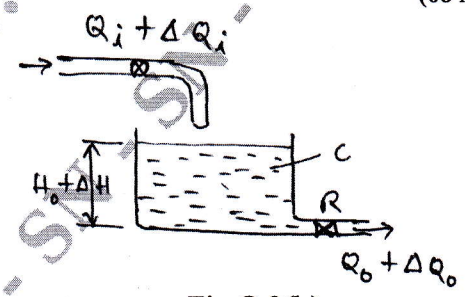

Fig.Q.3(b)

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)**

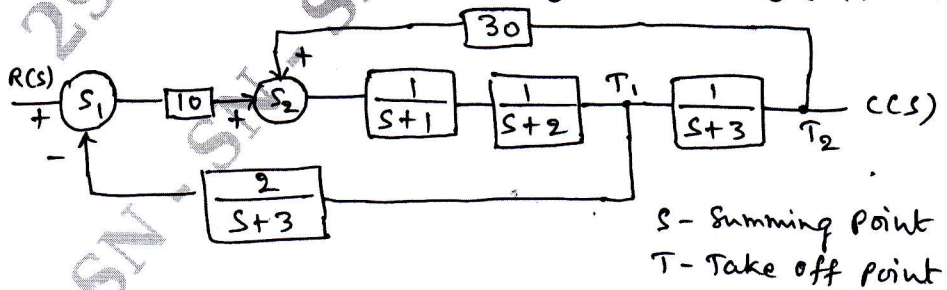

Fig.Q.4(a)

b. Find the transfer function for the signal flow graph shown in Fig.Q.4(b) by using Mason's gain formula. **(08 Marks)**

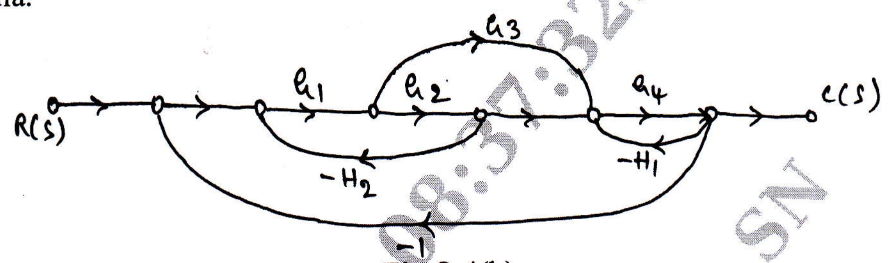

Fig.Q.4(b)

Module-3

5 a. A unity feed back system has $G(s) = \dfrac{40(s+2)}{s(s+1)(s+4)}$. 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 cross 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. $G(s)H(s) = \dfrac{1}{s(1+2s)(1+s)}$. 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

$$\dot{x} = \begin{bmatrix} -3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} x + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix} u \qquad y = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} x$$ **(08 Marks)**

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