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10ME/PM82

Eighth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Control Engineering

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART - A

- 1 a. Define: i) System; ii) Controller; iii) Open loop system; iv) Closed loop system; v) Feed back, with examples. (05 Marks)
 b. With the help of block diagram, explain i) PI ii) PID. (10 Marks)
 c. List the advantages and disadvantages of i) Proportional controller; ii) Integral controller. (05 Marks)

- 2 a. Write the differential equations governing the mechanical system shown. Also draw F-V and F-C analogous circuits. (14 Marks)

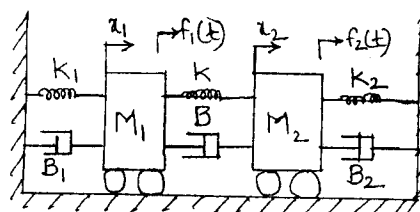


Fig.Q.2(a)

- b. Obtain the transfer function for the given thermal system. (06 Marks)

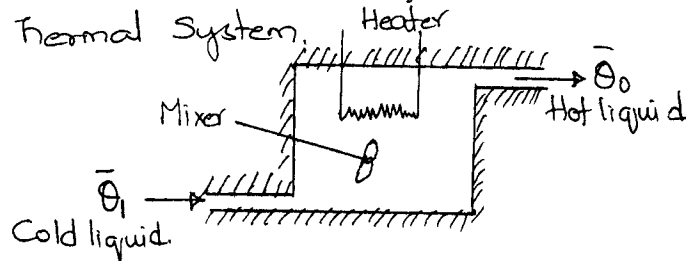


Fig.Q.2(b)

- 3 a. Reduce the block diagram and obtain control ratio $\frac{C(s)}{R(s)}$. (10 Marks)

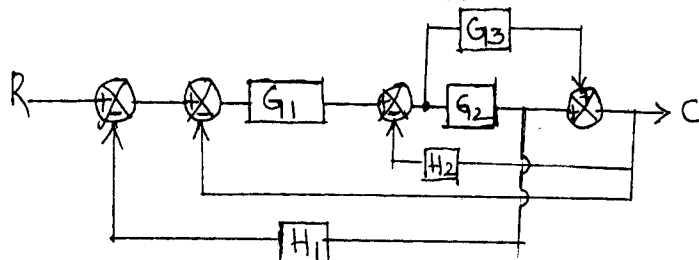
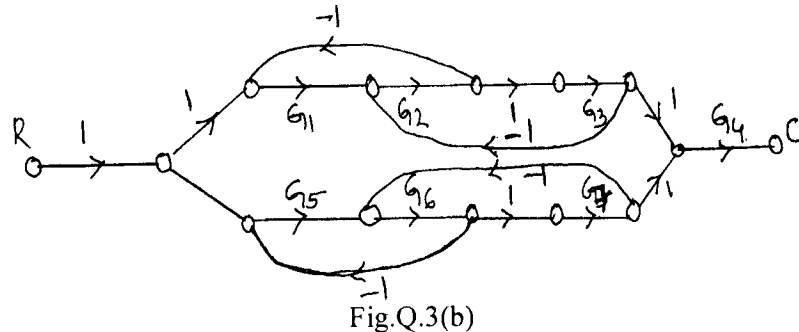


Fig.Q.3(a)

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.

- b. Obtain the overall TF $\frac{C(s)}{R(s)}$ of the SFG given: (10 Marks)



- 4 a. Define: i) Time response; ii) Step signal; iii) Ramp signal; iv) Parabolic signal; v) Impulse signal. (05 Marks)
 b. Derive an expression for response of 1st order system for unit step input. (05 Marks)
 c. A unity feedback CS has an OLTF $G(s) = \frac{10}{s(s+2)}$. Find tr, %M_p, t_p, t_s for a step input of 12 units. (05 Marks)
 d. Using R-H criterion, determine the stability of the system represented by the characteristic equation $s^5 + 4s^4 + 8s^3 + 8s^2 + 7s + 4 = 0$. (05 Marks)

PART – B

- 5 a. Construct a Nyquist plot for a feedback control system whose OLTF is given by $G(s)H(s) = \frac{5}{s(1-s)}$. Comment on the stability of open loop and closed loop system. (14 Marks)
 b. Define with respect to Nyquist plot, i) Gain Margin; ii) Phase Margin; iii) Relative stability. (06 Marks)
- 6 Sketch the bode plot for the following TF and determine phase margin and gain margin. (20 Marks)

$$G(s) = \frac{75(1+0.2s)}{s(s^2+16s+100)}$$
- 7 Sketch the root locus for UFB system whose open loop TF. (20 Marks)

$$G(s) = \frac{K}{s(s^2+6s+10)}$$
- 8 a. Define: i) State; ii) State variables; iii) State space; iv) State trajectory; v) State vector. (05 Marks)
 b. Write a note on: i) Lag compensator; ii) Lead compensator. (10 Marks)
 c. Explain the following terms with examples: i) Controllability; ii) Observability. (05 Marks)
