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10AE71

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

Time: 3 hrs.

Max. Marks:100

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

**PART – A**

- 1 a. Discuss about the open loop and closed loop control system with relevant diagrams and also list out its merits and demerits. (10 Marks)
- b. Explain the following controllers and also state its characteristics:
  - i) Proportional plus integral controller. (05 Marks)
  - ii) Proportional plus integral plus derivative controller. (05 Marks)
- 2 a. Derive the F-V and F-I analogies. (10 Marks)
- b. Derive the transfer function of liquid level system with interaction. (10 Marks)
- 3 a. List out the advantages and disadvantages of block diagrams. (03 Marks)
- b. Describe the rules for reduction of a block diagram. (07 Marks)
- c. State the properties of signal flow graph. (04 Marks)
- d. Find the transfer function of the system shown in below figure, using Masons Gain formula. (06 Marks)

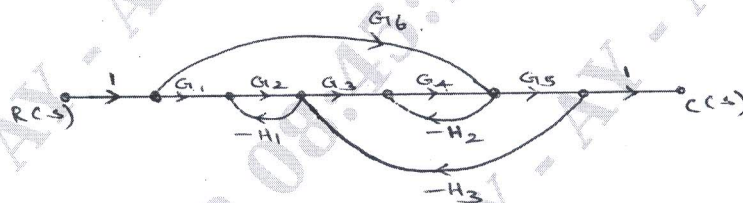


Fig.Q.3(d)

- 4 a. Derive the expression for unit step response of underdamped second order system. (10 Marks)
- b. Examine the stability of  $s^4 + 2s^3 + 3s^2 + 8s + 2 = 0$  using Routh-Hurwitz criterion. (06 Marks)
- c. Discuss about the special cases of Routh's criterion. (04 Marks)

**PART – B**

- 5 a. Sketch the polar plot for the transfer function:
 
$$G(s)H(s) = \frac{20(s+5)}{(s+1)(s+2)(s+8)}$$
 (10 Marks)
- b. Construct the Nyquist plot for a unity feedback control system whose open-loop transfer function is,
 
$$G(s)H(s) = \frac{K}{s(s^2 + 2s + 2)}$$
 Find the maximum value of K for which the system is stable. (10 Marks)

- 6 a. Define corner frequency. (02 Marks)  
b. Sketch the Bode plot and determine the gain crossover and phase-cross over frequencies for the system with,
- $$G(s) = \frac{10}{s(1 + 0.5s)(1 + 0.1s)}$$
- (18 Marks)
- 7 Draw the root locus for the system with open loop transfer function,
- $$G(s)H(s) = \frac{K}{s(s + 3)(s + 5)}$$
- (20 Marks)
- 8 a. What is meant by compensation? Discuss about the series and feedback compensation with neat diagrams. (10 Marks)  
b. With neat diagram, describe about the lag-lead compensator. (10 Marks)

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