

**III B. Tech I Semester Supplementary Examinations, May- 2018**  
**CONTROL SYSTEMS**

(Common to Electronics and Communication Engineering and Electronics and Instrumentation Engineering)

Time: 3 hours

Max. Marks: 70

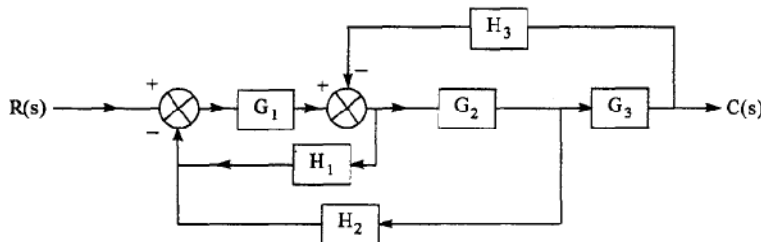
Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answering the question in **Part-A** is compulsory  
 3. Answer any **THREE** Questions from **Part-B**  
**(Normal and semi & polar graph sheet are to be supplied)**

**PART -A**

- 1 a) Explain the limitations of closed loop system over open loop system. [3M]
- b) Explain the advantages of signal flow graph over block diagram representation. [4M]
- c) What are Effects of proportional integral systems? [4M]
- d) What are effects by adding poles in the root locus? [4M]
- e) Define gain margin? [4M]
- f) What is Obsevability? [3M]

**PART -B**

- 2 a) Explain the temperature control system concepts using open loop as well as closed loop systems [8M]
- b) What is signal flow graph and explain the steps to reduce the system flow graph using mason gain formulae. [8M]
- 3 a) Derive the transfer function of field controlled DC Servo motor. [8M]
- b) Obtain the transfer function  $C(s)/R(s)$  by using Block diagram algebra for the figure given below: [8M]



- 4 a) For unity feedback system having open loop transfer function as  $G(s) = \frac{K(s+2)}{s^2(s^2+7s+12)}$ . Determine error constants  $K_p$ ,  $K_v$  and  $K_a$ ? [8M]
- b) A unity feedback control system has an open loop transfer function,  $G(s) = \frac{10}{s(s+2)}$  [8M]  
 Find the rise time, percentage overshoot, peak time and settling time for a step input of 12 units.



- 5 a) The characteristics equation of feedback control system is  $S^3 + 3KS^2 + (K + 2)S + 4 = 0$  . determine the range of K for which system is stable. [8M]
- b) Plot the root locus pattern of a system whose forward path transfer function is  $G(s) = \frac{K(s+1)}{s^2(s+2)}$  . [8M]
- 6 a) Find the Gain margin and phase margin of the system if the open loop transfer function is  $G(s) = \frac{5}{s(s+2)}$  [8M]
- b) The open loop transfer function of a feedback control system is given by  $G(s)H(s) = \frac{K}{s^2+s-2}$  Plot the Nyquist plot and show that the closed loop system is stable if  $\geq 2$  . [8M]
- 7 a) What is lag compensator? [4M]
- b) A unity feedback system has an open loop transfer function,  $G(s) = \frac{K}{s(1+2s)}$  [12M]  
.design a suitable lag compensator so that phase margin is  $40^\circ$  and the steady state error for ramp input is less than or equal to 0.2.

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