

Code: EC4T1

II B.Tech - II Semester–Regular/Supplementary Examinations–April 2018

CONTROL SYSTEMS
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours

Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

$$11 \times 2 = 22$$

1. a) What are the advantages and disadvantages of open loop control systems?
- b) What are the fundamental component of mechanical system?
- c) What is the difference between type and order of a system?
- d) Give the expression for a maximum peak overshoot for a second order system.
- e) List the rules to construct a rootlocus.
- f) State and explain Routh-Hurwitz criterion.
- g) Define the terms Phase margin and gain margin.
- h) State and explain Nyquist stability criterion.
- i) What is Controllability and Observability.
- j) Compare transfer function and state variable approach.
- k) What is the effect of a PI controller on system performance?

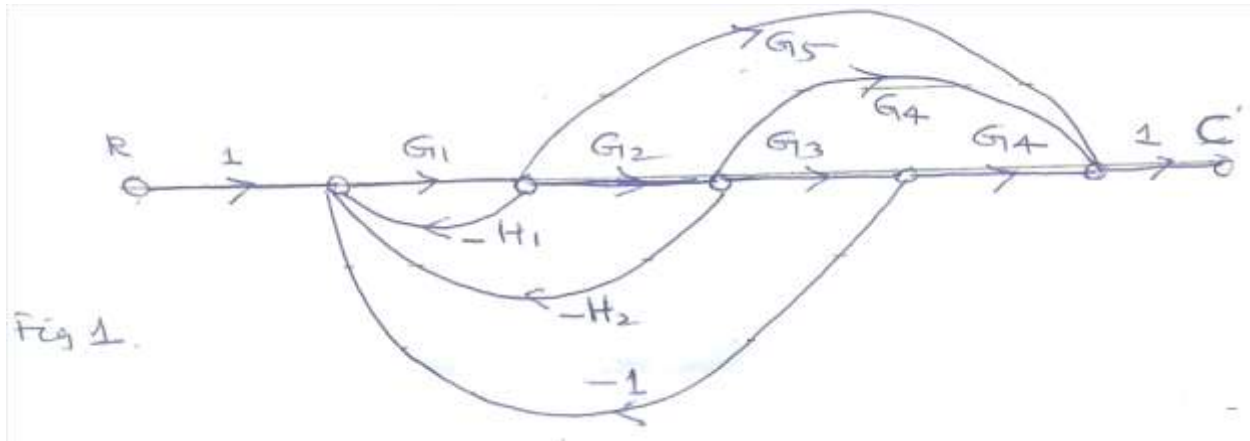
PART – B

Answer any **THREE** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Discuss the reduction techniques for obtaining transfer function of a block diagram. 6 M

b) The signal flow graph of a system is shown in Fig.1.
Determine the transfer function C/R using Mason's given formula. 10 M



3. a) The open loop transfer function of unity feedback system is $G(s) = K/s(s+T)$ where K and T are positive constants.
How many times gain should be increased to increase the overshoot from 40% to 60%? 8 M

b) A system has unit step response as $c(t) = 1 - e^{-0.1t}$. Determine its unit impulse and ramp response. Assume zero initial conditions. 8 M

4. a) Distinguish between absolute stability and relative stability. 6 M

b) A system has $G(s)H(s) = K/s(s+1)(s+2)(s+4)(s+8)$ where k is positive. Determine

- i) The range of k , for stability
- ii) Frequency of oscillation and the corresponding value of k by constructing root locus. 10 M

5. a) Draw the Bode plot for the transfer function

$G(s) = \frac{K}{s(s+1)(s+2)}$ and determine (i) Gain margin (ii) Phase Margin, comment on stability. 10 M

b) Explain in steps to get transfer function from the Bode diagram? 6 M

6. a) Explain the properties of state transition matrix. 6 M

b) Define controllability and observability and determine the same for the system given by $\dot{X} = \begin{bmatrix} -4 & -1 \\ 2 & -3 \end{bmatrix} X + \begin{bmatrix} 3 \\ 5 \end{bmatrix} U$ and $Y = [2 \quad 0] X$ 10 M