SCHOOL OF ENGINEERING AND TECHNOLOGY

D.C. COURT JUNCTION, DIMAPUR

End Term Examination June 2017

Course Code:	EC4T01	**Semester:**	IV	**TotalMarks**	60
Course Name:	**Control Engineering**			**Time:**	3hrs.

Answer the following questions

A. Choose the correct question. (10x1=10)

i. The Routh-Hurwitz criterion gives
   (a) relative stability
   (b) absolute stability
   (c) gain margin
   (d) phase margin

ii. The roots of the characteristic equation system are same as
   (a) closed loop zeros (c) closed loop poles
   (b) open loop zeros (d) open loop poles

iii. Insertion of a negative feedback in a control system affects
   (a) the transient response to vanish uniformly
   (b) the transient response to decay very fast
   (c) no change in transient response
   (d) the transient response decays at a slow rate

iv. A type 1 system is subject to acceleration input signal leads to steady state error as
   (a) 1 (b) K (c) 1/K (d) infinity

v. The stability of a system
   (a) decreases as the type of system increases
   (b) increases as the type of system increases
   (c) does not change as the type of system increases
   (d) none of the above

vi. While increasing the value of gain factor K the system becomes
   (a) less stable (c) more stable
   (b) unstable (d) absolutely stable

vii. The initial slope of the Bode plot given an indication of
   (a) type of the system
   (b) nature of the system time response
   (c) system stability
   (d) gain margin

viii. The frequency at which the magnitude of the Bode plot with 0 db axis gives
   (a) natural frequency
   (b) phase crossover frequency
   (c) gain crossover frequency
   (d) corner frequency

ix. The lag-compensation has a
   (a) zero nearer to the origin
   (b) pole nearer to the origin
   (c) pole at the origin
   (d) zero at the origin

x. The analysis of multi input multi output system is conveniently studied by
   (a) state space approach
   (b) root locus approach
   (c) characteristic equation approach
   (d) none of the above

B. Answer any five of the following question. (5x4=20)

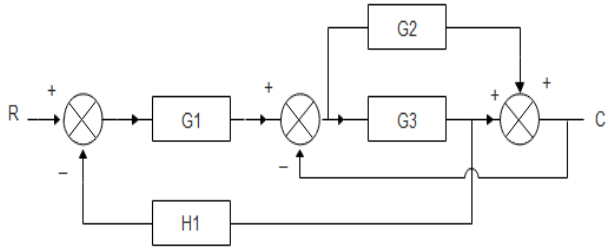
1. Write a short note on state space analysis of control system.
2. Define steady state error. Explain the different types of static error coefficient.
3. Explain in brief the stability of a control system.
4. List out the important rules for block diagram reduction
5. Explain the time response of a second order control system when damping ratio $\zeta>1$ and $\zeta<1$.
6. Using Routh-Hurwitz criterion determine the stability of a system whose transfer function is given as

$$\frac{C(s)}{R(s)} = \frac{2s+5}{s^5+1.5s^4+2s^3+4s^2+5s+10}$$

7. Define the following terms.
compensation network; transfer function; transfer matrix; closed loop control system.

C. I. Answer any two of the following question (2x6=12)

8. Discuss phase lead compensation network in a control system. Gives its merits and demerits.
9. Derive the transfer matrix expression for a control system having multi-input multi-output system.
10. Draw the signal flow graph and determine the transfer function relating C and R for the block diagram, using Manson's gain formula



II. Answer any two of the following question. (2x9=18)

[*Plot the figure using graph and semi-log graph paper.*]

11. Using Nyquist criterion investigate the closed loop stability of the system whose open loop transfer function is given as

$$G(s)H(s) = \frac{K(s+1)}{(s+0.5)(s-2)}$$

Consider (i) K=1.25, (ii) K=2.5
Also determine the limiting value of K for stability

12. The open loop transfer function of a control system is given as

$$G(s)H(s) = \frac{K}{s(s+6)(s^2+4s+13)}$$

13. Sketch the Bode plot for the open loop transfer function for the unity feedback system given below and assess stability

$$G(s) = \frac{50}{(s+1)(s+2)}$$

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