

C.U.SHAH UNIVERSITY

Summer Examination-2018

Subject Name: Linear Control Theory**Subject Code: 4TE05LCT1****Branch: B.Tech (Electrical)****Semester: 5****Date: 23/03/2018****Time: 10:30 To 01:30****Marks: 70**

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

- a) Which terminology deals with the excitation or stimulus applied to the system from an external source for the generation of an output?
(a) Input signal (b) Output signal (c) Error signal (d) Feedback signal
- b) The output is said to be zero state response because _____ conditions are made equal to zero.
(a) Initial (b) Final (c) Steady state (d) Impulse response
- c) Which notation represents the feedback path in closed loop system representation?
(a) b(t) (b) c(t) (c) e(t) (d) r(t)
- d) Basically, poles of transfer function are the Laplace transform variable values which causes the transfer function to become _____.
(a) Zero (b) Unity (c) Infinite (d) Average value
- e) By equating the denominator of transfer function to zero, which among the following will be obtained?
(a) Poles (b) Zeros (c) Both a and b (d) None of the above
- f) The output signal is fed back at the input side from the _____ point
(a) Summing (b) Differential (c) Take-off (d) All of the above
- g) In a parallel combination, the direction of flow of signals through blocks in parallel must resemble to the main _____.
(a) Forward (b) Feedback (c) Opposite (d) Diagonal
- h) In a signal flow graph, nodes are represented by small _____.
(a) Circles (b) Squares (c) Arrows (d) Pointers
- i) Which type of node comprises incoming as well as outgoing branches?
(a) Source node (b) Sink node (c) Chain node (d) Main node
- j) According to the property of impulse test signal, what is the value of an impulse at $t = 0$?
(a) Zero (b) Unity (c) Infinite (d) Unpredictable
- k) What is the value of parabolic input in Laplace domain?
(a) 1 (b) A/s (c) A/s^2 (d) A/s^3
- l) In second order system, which among the following remains independent of gain (k)?
(a) Open loop poles (b) Closed loop poles (c) Both a and b (d) None of the above
- m) Which condition is used to verify the existence of a particular point on the root locus?
(a) Amplitude (b) Frequency (c) Magnitude (d) Angle



- n) Which unit is adopted for magnitude measurement in Bode plots?
 (a) Degree (b) Decimal (c) Decibel (d) Deviation

Attempt any four questions from Q-2 to Q-8

Q-2 Attempt all questions (14)

- (a) Define the Term (07)
 i)Phase Margin ii)Gain Margin iii)Steady state response iv)Steady state error
 v) Delay time vi) Rise time vii) Peak Time.
 (b) Explain the differences between Open loop and Close loop control system with examples. (07)

Q-3 Attempt all questions (14)

- (a) Using the block diagram reduction techniques, find the closed loop transfer Function of the system whose block diagram is given in Fig.1. (07)

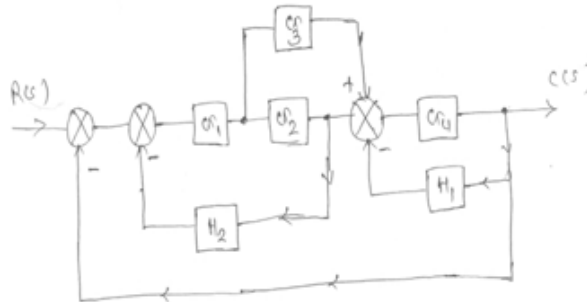


Fig.1.

- (b) Write the equilibrium equation for the mechanical system and obtain the F-I analogous system. Fig.2 (07)

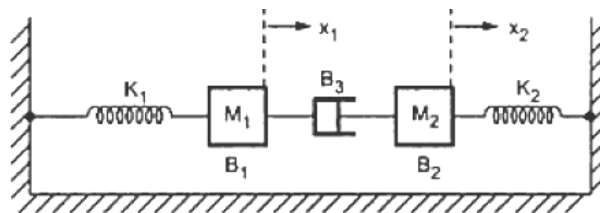


Fig.2

Q-4 Attempt all questions (14)

- (a) Define the term (1) Transfer function (2) state (3) Self loop (4) Source node (5) Sink node. (05)
 (b) Write a short note on Standard Test Signal. (05)
 (c) State the advantages and limitations of Routh's method. (04)

Q-5 Attempt all questions (14)

- (a) Obtain overall transfer function C/R of the system whose signal flow graph shown in Fig.3 (07)

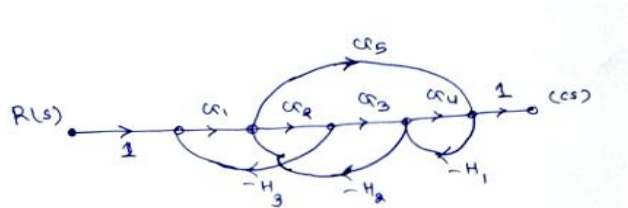


Fig.3



- Q-6** (b) Derive the expression for static error coefficient. (07)
Attempt all questions (14)
 (a) Obtain the state model of the given electrical system Fig.4 (07)

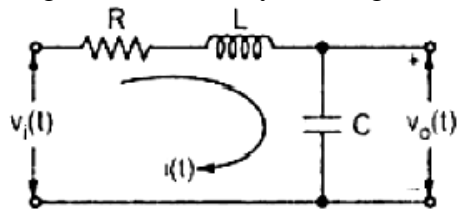


Fig.4

- Q-7** (b) Explain about liquid level system giving suitable example. Obtain its transfer function (07)
Attempt all questions (14)
 (a) For a Unity feedback system $G(s) = \frac{K}{s(s+2)(s+10)}$. Find out Marginal Value of 'K' for (10)
 Which system will be marginally stable, using Bode Plot.
- Q-8** (b) What are Advantages of Nyquist Plots? (04)
Attempt all questions (14)
 (a) Sketch the Root Locus for the system having $G(S)H(S) = \frac{K}{s(s+1)(s+3)}$ (10)
 (b) What are Advantages of Root Locus Method? (04)

