

# C.U. SHAH UNIVERSITY

## Winter Examination-2022

**Subject Name: Linear Control Theory**

**Subject Code: 4TE05LCT1**

**Branch: B.Tech (Electrical)**

**Semester: 5**

**Date: 23/11/2022**

**Time: 02:30 To 05:30**

**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.
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**Q-1**

**Attempt the following questions:**

**(14)**

- a) A control system in which the control action is somehow dependent on the output is known as
  - a) Closed loop system
  - b) Semi closed loop system
  - c) Open system
  - d) None of the mentioned
- b) In closed loop control system, with positive value of feedback gain the overall gain of the system will
  - a) decrease
  - b) increase
  - c) be unaffected
  - d) none of the mentioned
- c) Which of the following is an open loop control system?
  - a) Field controlled D.C. motor
  - b) Ward leonard control
  - c) Metaldyne
  - d) Stroboscope
- d) The following has tendency to oscillate.
  - a) Open loop system
  - b) Closed loop system
  - c) Both (a) and (b)
  - d) Neither (a) nor (b)
- e) A good control system has all the following features except
  - a) good stability
  - b) slow response
  - c) good accuracy
  - d) sufficient power handling capacity
- f) The output of the feedback control system must be a function of:
  - a) Reference input



- b) Reference output
- c) Output and feedback signal
- d) Input and feedback signal
- g) In regenerating the feedback, the transfer function is given by
  - a)  $C(s)/R(s)=G(s)/1+G(s)H(s)$
  - b)  $C(s)/R(s)=G(s)H(s)/1-G(s)H(s)$
  - c)  $C(s)/R(s)=G(s)/1+G(s)H(s)$
  - d)  $C(s)/R(s)=G(s)/1-G(s)H(s)$
- h) Transient response analysis is done for\_\_\_\_\_ systems.
  - a) Unstable
  - b) Stable
  - c) Conditionally stable
  - d) Marginally stable
- i) Standard test signals in control system are:
  - a) Impulse signal
  - b) Ramp signal
  - c) Unit step signal
  - d) All of the mentioned
- j) It is generally used to analyse the transient response to one of the standard test signals.
  - a) True
  - b) False
- k) While increasing the value of gain K, the system becomes
  - a) Less stable
  - b) More stable
  - c) Unstable
  - d) Absolute stable
- l) Routh Hurwitz criterion is better than root locus.
  - a) True
  - b) False
- m) Number of roots of characteristic equation is equal to the number of \_\_\_\_\_
  - a) Branches
  - b) Root
  - c) Stem
  - d) Poles
- n) Low power DC and AC motors are also known as \_\_\_\_\_
  - a) Servomotors
  - b) Tachogenerators
  - c) A.C. generators
  - d) D.C. generators

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

**Q-2**

**Attempt all questions**

**(14)**

- a) Explain the difference between open loop and close loop control system with examples. **(7)**
- b) Explain schematic block diagram of control system. **(7)**



- Q-3 Attempt all questions (14)**  
a) Define the terms: (7)  
(i) Time Response (ii) Transient Response (iii) Steady state response (iv) Steady State error (v) Delay time (vi) Rise time (vii) Peak Time.  
b) What is an analogue system? Explain force voltage and force current analogy. (7)
- Q-4 Attempt all questions (14)**  
a) Write down rules of block diagram system. (7)  
b) Explain spring and friction in control system. (7)
- Q-5 Attempt all questions (14)**  
a) Write short note on Mason's Gain formula. (7)  
b)  $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$  check the stability of the given characteristic equation using Routh's method. (7)
- Q-6 Attempt all questions (14)**  
a) Sketch the Root Locus for the system having  $G(S)H(S) = K/s (s+1) (s+3)$  (7)  
b) What are advantages of Root Locus Method? (7)
- Q-7 Attempt all questions (14)**  
a) Derive the transfer function of simple liquid level system. (7)  
b) Explain standard test input signals. (7)
- Q-8 Attempt all questions (14)**  
a) What advantages are of bode plots? (7)  
b) For a unity feedback system,  $G(s) = K/s (s+2) (s+10)$ . Find the marginal value of 'K' for which system will be marginally stable using bode plot. (7)

