**Reg. No. :** | | | | | | | | | | |

# Question Paper Code: 54522

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Fourth Semester

Electronics and Communication Engineering

01UEI422 – LINEAR CONTROL ENGINEERING

(Regulation 2013)

Duration: 1.15 hrs Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

**(Answer any six of the following questions)**

1. An element which stores potential energy?

   (a) mass (b) spring (c) damper (d) none of these

2. Which of the following is an open loop control system

   (a) Field controlled D.C. motor (b) Ward leonard control

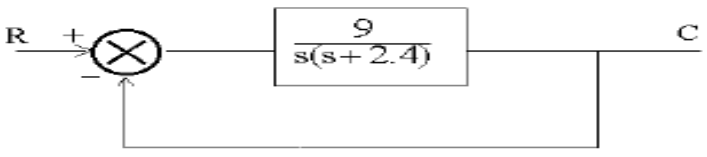
   (c) Metadyne (d) Stroboscope

3. The steady-state error of a feedback control system with an acceleration input becomes finite in a

   (a) Type 0 system (b) Type 1 system

   (c) Type 2 system (d) Type 3 system

4. Considering the unity feedback system of Fig.2, the settling time of the resulting second order system for 2% tolerance band will be



(a) 3.33 (b) 4.5 (c) 2.25 (d) 2.84

5. If the Nyquist plot of the loop transfer function G(s)H(s) of a closed-loop system encloses the (−1, j0) point in the G(s)H(s) plane, the gain margin of the system is

(a) zero (b) greater than zero
(c) less than zero (d) infinity

6. Which of the following is the time domain method of determining stability of a control system

(a) Bode plot (b) Nyquist plot
(c) Root locus (d) Nichols chart

7. The equation $2S^4 + S^3 + 3S^2 + 5S + 10$ has _____ number of roots in the left half of s–plane.

(a) One (b) Two (c) Three (d) Four

8. Consider the following statements regarding root loci:

1. All root loci start from the respective poles of G(s) H(s).
2. All root loci end at the respective zeros of G(s) H(s) or go to infinity.
3. The root loci are symmetrical about the imaginary axis of the s-plane.

On these statements:

(a) 1, 2 and 3 are correct (b) 1 and 2 are correct
(c) 1 and 3 are correct (d) 2 and 3 are correct

9. The state space approach is applicable to the control systems which are

(a) Time variant (b) Time invariant (c) Both (a) and (b) (d) None of these

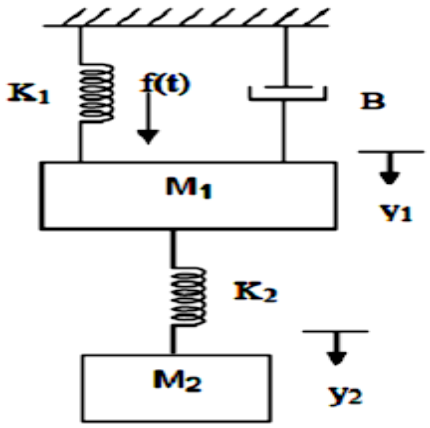
10. The advantage of state space model is

(a) Applicable for linear and non-linear system
(b) Applicable for only linear system controllable
(c) Applicable for time invariant system only
(d) Applicable for continuous –time system only

PART – B (3 x 8= 24 Marks)

**(Answer any three of the following questions)**

11. Write the differential equations governing the mechanical system shown in figure and determine the transfer function. (8)

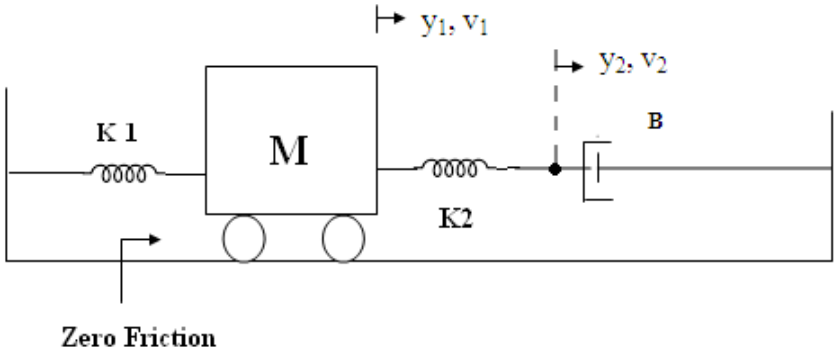



12. Derive the expression for the response of first order system for unit step input. (8)

13. A unity feedback control system has $G(s) = \frac{K}{s(s+4)(s+10)}$. Draw the Bode plot. Find $K$ when phase margin $30^o$. (8)

14. Determine the range of values of K for the system to be stable.
$s^3 + 3Ks^2 + (K+2)s + 4 = 0$. (8)

15. Obtain the state model of the mechanical system shown in Fig. 4 by choosing a minimum of three state variables. (8)



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