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

# Question Paper Code: 54303

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

Fourth Semester

Electrical and Electronics Engineering

15UEE403- CONTROL SYSTEMS

(Regulation 2015)

Duration: 1.15 hrs Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

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

1. Transfer function of a system is used to calculate which of the following? CO1- U

   (a) The order of the system (b) The time constant

   (c) The output for any given input (d) The steady state gain

2. The overall transfer function from block diagram reduction for cascaded blocks is given by CO1-U

   (a) Sum of individual gain (b) Product of individual gain

   (c) Difference of individual gain (d) Division of individual gain

3. If the characteristic equation of a closed-loop system is $s^2+2s+2=0$, then the system is CO2 -U

   (a) Over damped (b) Critically damped (c) Under damped (d) undamped

4. Root locus is used to calculate CO2 -R

   (a) Marginal stability (b) Absolute stability

   (c) Conditional stability (d) Relative stability

5. The unit adopted for magnitude measurement in Bode plots is CO3-R

   (a) Degree (b) Decimal (c) Decibel (d) Deviation

6. The frequency at which magnitude of closed loop response is ----- down from its zero frequency value is called as cut off frequency. CO3-R

   (a) 0.3dB. (b) 30dB (c) 0.33dB (d) 3dB

7. For Nyquist contour, the size of radius is CO4-R

(a) Zero (b) Unity (c) Infinity (d) Constant

8. The characteristic equation of a system is given as $3S^4+10S^3+5S^2+2=0$. CO4-U
This system is :

(a) Marginally stable (b) Stable (c) Unstable (d) Linear

9. State space analysis is applicable even if the initial conditions are CO5- U

(a) Zero (b) Non-zero (c) Equal (d) Not equal

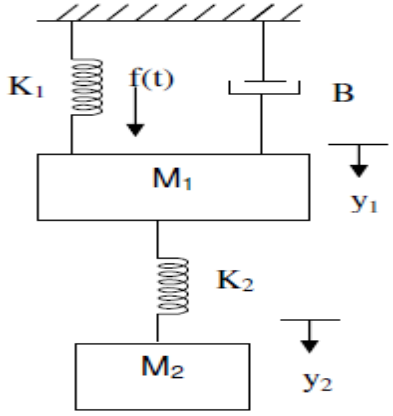
10. Solution of state equation is---------- CO5 -R

(a) $e^{-At}X(0)$ (b) $e^{At}$ (c) $e^{At}X(0)$ (d) $-e^{At}X(0$

PART – B (3 x 8= 24 Marks)

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

11. Determine the transfer function $Y_2(S)/F(S)$ of the system shown in CO1- App (8)




12. Determine the generalized error coefficient and steady state error for a system whose open loop transfer function is G(s) = 1/ (S(S+1)(S+10)) and the feedback transfer function is H(s) = (S+2) with input r(t) = 6+ t + $t^2$ CO2- App (8)

13. The open loop transfer function of a unity feedback system is given by CO3- App (8)

G(S) $= \frac{1}{S(S+1)(2S+1)}$. Sketch the polar plot and determine the gain margin and phase margin.

14. Explain the procedure for the design of the lag compensator based on frequency response approach. CO4- Ana (8)

15. The state model of the system is given by CO5- Ana (8)

$$\begin{bmatrix} \dot{x_1} \\ \dot{x_2} \\ \dot{x_3} \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 10 \end{bmatrix} u;$$

$$y = [1 \quad 1 \quad 0] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Find the transfer function for the given state model.