Paper / Subject Code: 32023 / Control System

1T00835 - T.E.(Electrical Engineering)(SEM-V)(Choice Base Credit Grading System) (R- 19) (C Scheme) / 32023 - Control System   QP CODE: 10037792   DATE: 29/11/2023

**Time- 3 Hours**   **Marks:80**

1. Question no. 1 is compulsory

2. Solve any three questions out of remaining five questions

3. Figures to the right indicate full marks

4. Solve any four questions out of remaining six questions

Q. 1	Solve any four	Marks
A)	Define stability, instability in the form of crossover frequencies, GM and PM from Bode diagram.	05
B)	Plot the roots in s- plane for over damped, under damped, critically damped and un-damped system.	05
C)	Compute the transfer function from state space model if A= $\begin{bmatrix} 0 & 1 \\ -3 & -8 \end{bmatrix}$ $B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ C= $[3 \quad 4]$ $D = 0$	05
D)	Using Routh's stability criterion determine the range of K, so that system remain stable for unity feedback system in which open loop system is given by G(S)H(S)=K/S(1+S)(1+2S)	05
E)	Find out breakaway point for the root locus of open loop transfer function G(S)=K/S(S+2)(S+4)	05
Q 2 A)	Derive the relation for output time response for second order undersamped underdamped system for the step input of magnitude 2 units.	10
B)	Find out all time domain parameters for the second order underdamped transfer function C(S)/R(S)= 12(S^2 + 4S +8). Also find out expression of output response.	10
Q 3 A)	Using Mason's gain formula find out transfer from the given signal flow graph	10
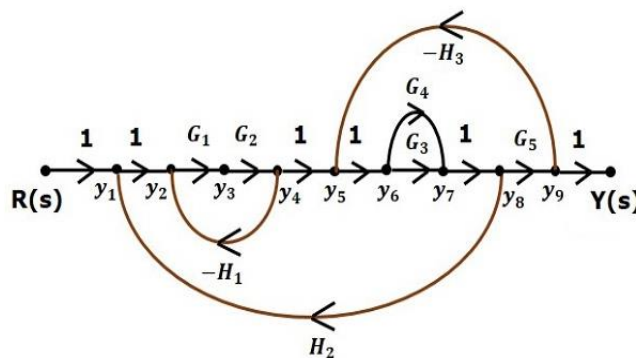
B) Sketch the complete Polar plot and comment on stability for G(S)= 1/S(S+1)(2S+1)　　10

Q 4 A) Draw complete root locus and comment on stability for unity feedback system　　10

$$G(S)= K/S(S+3)(S^2 + 3S+4.5)$$

B) Obtain state model of the transfer function $T(F)= (S^2+3S+3)/(S^3+2S^2+3S+1)$. Draw signal flow graph.　　10

Q 5 A) Find Type of a system, all error constants and find steady state error for unit parabolic input.　　10

$$G(S)=1000(S+2)/S(S^3+7S^2 +12S)$$

B) Draw Bode plot and comment on stability for G(S)= 100/S(S+2)(S+5)　　10

Q 6 A) For unity feedback system, determine resonance peak and resonance frequency.　　10

$$G(S)=100/S(S+5)$$

B) Construct the complete Nyquist plot for a unity feedback control system whose open loop transfer function is $G(S)H(S)= K/S(S^2 +2S+2)$. Find the value of K for which the system is stable.　　10

_____

37792　　　　　　　　**Page 2 of 2**