Printed Pages: 02 **Subject Code:EEE502/NEE503**

Paper Id: 120517 **Roll No:** | | | | | | | | | | |

B TECH

(SEM-V) THEORY EXAMINATION 2018-19

CONTROL SYSTEM

Time: 3 Hours ***Total Marks:100***

Notes: *Assume any Missing Data.*

SECTION – A

1. Attempt all parts of the following. **(2x10=20)**

(a) What is the type of control systems?

(b) Define the PI and PID controllers.

(c) Explain the open loop and closed loop control system.

(d) Determine the stability of the system whose characteristics equation is given by $2S^4 + 2S^3 + S^2 + 3S + 2 = 0$.

(e) Discuss the advantages of state variable technique over transfer function approach.

(f) Discuss the effect of feedback on the time constant of a control system.

(g) What is a Signal flow graph?

(h) Discuss the significance of various time domain specifications.

(i) Define the term rise time and settling time.

(j) What is the relative stability?

SECTION – B

2. Attempt any three parts of the following: **(3x10=30)**

(a) For a unity feedback system the open loop transfer function is given by

$$G(s) = K/S(1+ST)$$

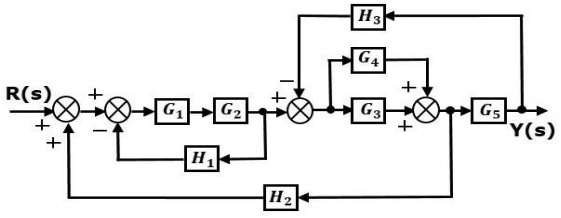
where K and T are positive constants. By what factor should the amplifier gain be reduced so the the peak overshoot of unit step response of the system is reduced from 75% to 25%.

(b) Draw the Nyquist plot for the unity feedback system whose open loop transfer function is

$$G(s)H(s) = \frac{K(1-s)}{(1+s)}$$

(c) Write short notes on PD controller and Synchros.

(d) Determine the transfer function of the given block diagram-



(e) Give the rules for construction of root locus of an open loop control system.

SECTION - C

3. Attempt any one parts of the following: (1x10=20)

(a) Derive the expression for resonant frequency and resonant peak for second order control system.

(b) Sketch the polar plot for the following transfer function

$$G(S) = K/ S (1+ST_1) (1+ST_2)$$

4. Attempt any one parts of the following: (1x10=20)

(a) For a closed loop system whose transfer is

$$G(s)H(s) = \frac{Ke^{-ST}}{s(s+1)}$$

Determine the maximum value of the gain 'K' for stability.

(b) Derive the expressions for second order system for under damped case and when the input is unit step.

5. Attempt any one parts of the following: (1x10=20)

(a) What is closed loop frequency response? Give an account of the correlation between time response and frequency response for a second order system with relevant expressions.

(b) A single input signal output system is given as

$$\frac{Y(S)}{U(S)} = \frac{2}{S^3 + 6S^2 + 11S + 6}$$

Test for controllability and observability.

6. Attempt any one parts of the following: (1x10=20)

(a) Determine the value of K for a unity feedback control system having open-loop transfer function, if the gain margin is 20db

$$G(s)H(s)= \frac{K}{S(S+2)(S+4)}$$

(b) The forward path transfer function of unity feedback control system is G(s) = 200/s(s+6.45). Find the resonance peak M_r, resonant frequency ω_r and bandwidth of the closed loop system.

7. Attempt any one parts of the following: (1x10=20)

(a) Obtain state equation of a given transfer function

$$\frac{Y(S)}{U(S)} = \frac{1}{S^3 + 2S^2 + 3S + 1}$$

(b) Discuss the significance of lag network. Also draw its s-plane representation and bode plot.