Printed Pages : 4 | 209/232 | EEE-502/NEE-503

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 121522/121503 Roll No. | | | | | | | | |

B.Tech.

(SEM. V) THEORY EXAMINATION, 2015-16

CONTROL SYSTEM

Time : 3 hours] **[MaximumMarks : 100**

Section-A

Note : Attempt all sections. All sections carry **equal** marks. Write answer of each part in short. (2×10=20)

(a) Explain open loop and closed system with physical examples.

(b) State the necessary & sufficient condition of Routh Hurwitz criterion.

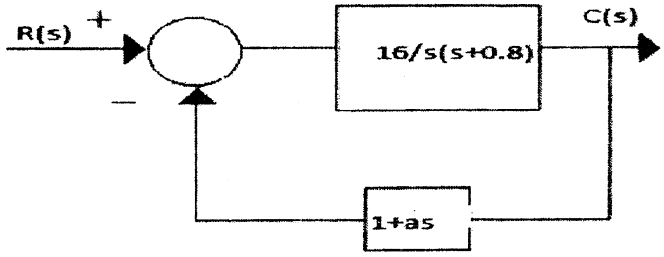
(c) Explain the significances of constant M & N circles.

(d) What is the need of compensation in control system?

(e) Draw the polar plot of open loop transfer function $\frac{1}{s^2}$.

(f) What are state and state variables?

(g) Consider the system as shown in Fig Determine the value of 'a' such that the damping ratio is 0.5.



(h) Define Rise time & Delay time for second order control system.

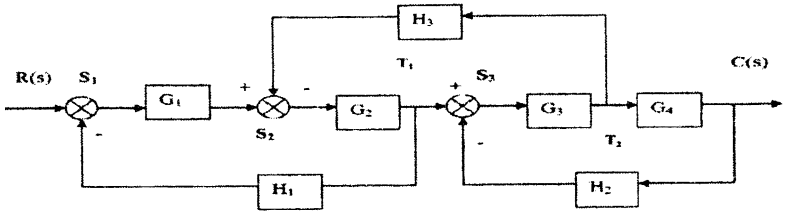
(i) Explain Mason's gain formula.

(j) Define the term Centroid & Break Away point.

Section-B

Note: Attempt **any five** questions of the following. (10×5=50)

2. Determine the transfer function C(s)/R(s) for the block diagram shown in Fig. below



3. Derive the expression for step response of second order control system for under-damped.

4. Using Routh's stability criterion, determine the range of K open loop transfer function

$$G(s)H(s)=\frac{K}{s(s+1)(1+2s)}$$

5. Construct Root loci for open loop transfer function:

$$G(S)H(S)=\frac{K}{S(S+1)(S+3)}$$

6. Derive expression for resonant frequency and resonant peak for second order control system.

7. Sketch the Nyquist plot for the system with open loop transfer function

$$G(s)H(S)=\frac{60}{(s+1)(S+2)(s+5)}$$ and comment on stability.

8. Write short notes on PD controller and Synchros.

9. Obtain state equation of a given transfer function"

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

b) $$\frac{Y(s)}{U(s)}=\frac{1}{(s+1)(s+4)}$$

Section-C

Note: Attempt **any two** questions of the following.

(15×2=30)

10. For a unity feedback system, the open loop transfer function is

$$G(s)H(s)=\frac{2(s+0.25)}{s^2(s+1)(s+0.5)}$$

Draw Bode Plot and determine gain margin, phase margin, ω_{gc} and ω_{pc}.

11. A system characterised by the transfer function $\frac{Y(s)}{u(s)}=\frac{2}{s^3+6s^2+11s+6}$ Find the state and output equation in matrix from and also test the controllability and observability of the given system.

12. Write short notes of the following:

    (a) Lead compensator

    (b) Lag compensator

    (c) Gain Margin and Phase Margin

—x—