Printed Pages: 7

NEE - 503

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

Paper ID : 2289789   Roll No.

B.TECH.

Regular Theory Examination (Odd Sem-V), 2016-17

CONTROL SYSTEM

Time : 3 Hours   Max. Marks : 100

SECTION-A

1. Attempt all parts. All parts carry equal marks. Write answer of each part in short.   (10×2=20)

a) Discuss open loop and closed loop system giving suitable examine.

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

c) Explain the working of A.C servomotor with neat diagram.

d) Give the comparison between PI and PID controller.

e) Discuss the significance of various time domain specifications.

f) Establish the relation between Routh and Hurwitz stability criterion.
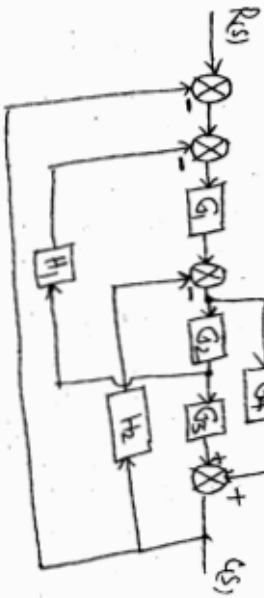
503/12/2016/5600   (1)   [P.T.O.

NEE - 503

g) Explain in brief :
   i) Gain Margin
   ii) Phase Margin.

h) What do you understand by relative stability? Explain.

i) Differentiate between lag and lead network in view of their Bode - Plot.

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

SECTION - B

Attempt any three questions from this section

(3×10=30)

1. Using block diagram reduction techniques, find the closed loop transfer function of the system whose block diagram is given in fig. 1

NEE - 503

2. Derive the expression for second order system response when subjected to unit impulse input for damping ratio $(\zeta)<1$.

   A unity feedback system is characterized by an open loop transfer function.

   $$G(s) = \frac{K}{s(s+10)}$$

   Determine the gain 'K' so that the system will have a damping ratio of 0.5. For this value of 'K', Determine the settling time, peak overshoot and time to peak overshoot for a unit step input

3. 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.

4. 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.

5. i) Derive the transfer function from state model.(2)
   ii) Obtain the complete solution of nonhomogeneous state equation using time domain method. (2)
   iii) Discuss the significance of Lag network. Also draw its s-plane representation and bode plot.

NEE - 503

SECTION-C

Attempt all questions

1. Attempt any one part of the following. **(10×1=10)**

a) Find the transfer function of the signal flow graph shown in fig.2, using Mason's gain formulae.

fig.2

b) What do understand by the term sensitivity? Consider the feedback control system shown in fig.3. The normal value of the process parameter 'K' is 1. Determine the sensitivity of transfer function $T(s) = \dfrac{C(s)}{R(s)}$ to variations in parameter 'K', at w=5.
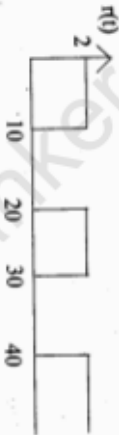
fig.3

503/12/2016/5600   (4)

NEE - 503

2. Attempt any one part of the following: **(10×1=10)**

a) Discuss different type of test signal used for analysis of control system in time domain.

The reference input to a unity feedback system is shown in fig. 4. 2m open loop transfer function of the system is.

$$G(s) = \frac{400(s+1)}{(s+2)(s+8)}$$

Calculate the steady-state error.

Fig.-4

b) Discuss the effect on the performance of a second order control system of

i) Derivative control

ii) Integral control.

3. Attempt any one part of the following **(10×1=10)**

a) Explain the working principle of stepper motor with neat diagram.

503/12/2016/5600   (5)   [P.T.O.