Roll No .....

EX - 602

B.E. VI Semester

Examination, June 2013

Control Systems

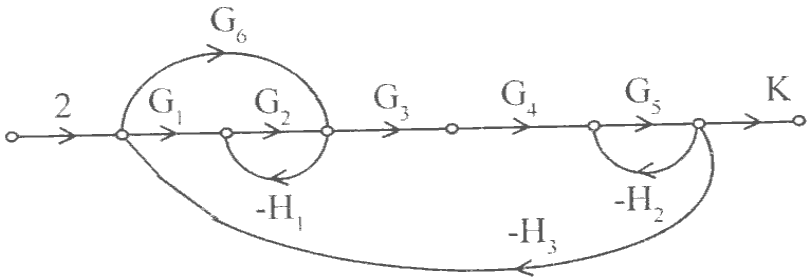
Time : Three Hours

Maximum Marks : 100 ***Minimum Pass Marks :35***

Note: Total number of questions : 05. Attempt all questions.

1. a) Discuss the scientific approach of developing mathematical model of a system. 10

   b) Obtain transfer function for a system, whose signal flow graph is shown below. 10



OR

Write short notes on: 20

i) Error detectors

ii) Open loop & closed loop system

iii) Transfer function

iv) Power amplifiers.

2. a) Differentiate between transient and steady state response. Illustrate all the time domain specification (transient & steady state) by suitable sketch. 10

   b) Determine position, velocity and acceleration error for

   i) Unit step,

   ii) Unit ramp and

   iii) Unit parabolic input, for the unity feedback control system with the open loop transfer function.

$$G(s)=\frac{K(1+0.5s)}{s^2\left(s^2+4s+5\right)}$$ 10

OR

The state model of the system is given by

$$\left[\dot{X}\right]=\begin{bmatrix}0 & 11\\ -12 & -7\end{bmatrix}X+\begin{bmatrix}0\\ 1\end{bmatrix}u(t)$$

$$y=\begin{bmatrix}-10 & -4\end{bmatrix}X+u(t)$$

Obtain state transition matrix and hence solve the equations for response 'y' when initial conditions are set to zero. 20

3. A unity feedback system has an open lop transfer function $G(s)=\frac{K(s+1)}{s(s+1)\left(s^2+2s+2\right)}$, by sketching root locus plot, comment on the stability of the system. Obtain the value of 'K' at which damping ratio = 0.5. 20

OR

Sketch the root locus of unity feedback system with open loop function $G(s)=\frac{K}{s(s+2)(s+3)(s+5)}$. Explain all the steps clearly and marks all salient points on root locus. 20

4. For a unity feedback system having open loop transfer function

$$G(s)=\frac{24(1+s)(1+0.2s)}{s(1+3s)(0.5s+1)(0.1s+1)}$$

Draw the Bode plots and determine gain margin and phase margin. 20

OR

a) Define & explain gain margin and phase margin with suitable example. 10

b) Explain and construct polar plot for 10

$$G(s)=\frac{1}{s(0.2s+1)(0.05s+1)}$$

5. Discuss the step by step procedure for designing of 20

i) Phase lead compensator

ii) Phase lag compensator, and

iii) Phase lag-lead compensator.

OR

Design a suitable compensator for a unity feedback system with transfer function $G(s)=\frac{16}{s(2s+1)(s+10)}$ to provide the phase margin of at least 45° and steady state error = 1%

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