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EEE502

B. Tech

(SEM V)CARRY OVER EXAMINATION, 2014-15

CONTROL SYSTEM

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

Note: (1) Attempt all Questions.

    (2) All question carry equal marks.

1)   Attempt **ANY FOUR** of the following: (5x4) = 20

    (a)   Compare Open Loop and Closed loop System with example.

    (b)   A system is represented by differential equation. Where x is i/p and y is o/p. Derive the Transfer function of the system.

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 5 = \frac{dx}{dt} + 4x$$

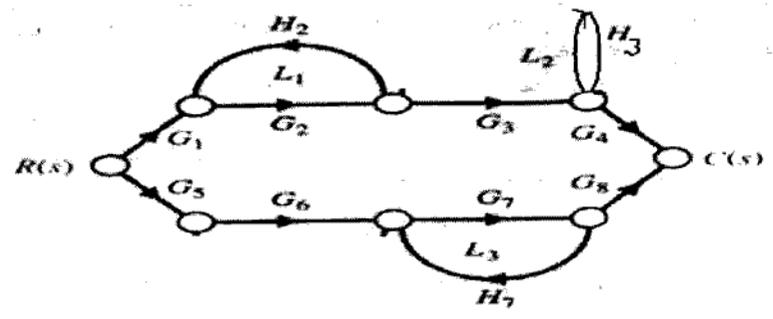(c) Write the Gain of following Signal flow graph shown in fig 1, by using mason's gain Formula.

Fig 1

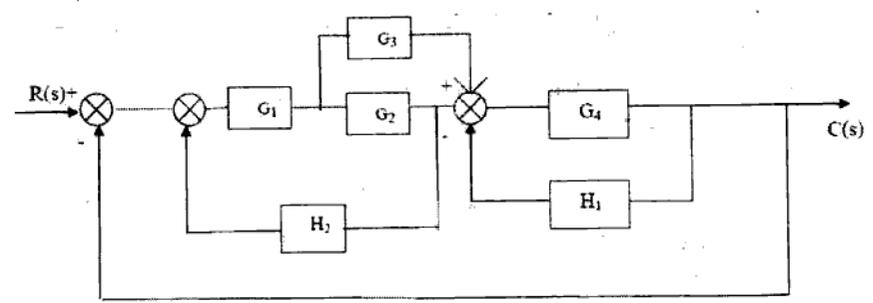(d) Using block diagram reduction techniques obtain C/R by reducing the block diagram shown below in figure 2.

Fig. 2

(e) Explain the effect of feedback on Gain, Band Width.

121504]   (2)   [Contd...

(f) Define and write mathematical expression for Standard Input signals used in Control System.

2) Attempt **ANY FOUR** of the following: **(5x4) = 20**

(a) For a system having closed loop transfer function for unit step i/p determine Wn, Mp, Wd, damping factor.

$$f_n = \frac{64}{S^2 + 5S + 64}$$

(b) Derive steady state error expression in terms of open loop transfer function G(s) having unity feedback system. Obtain ess for unit ramp input.

(c) Derive Kp, Kv and Ka for second order control system.

(d) The open loop transfer function is given G(s) = 40 / s*(0.2s+1), H(s) =1, find Dynamic error using error series where r(t)= 0.1 sin π t (rad)

(e) State the principle of proportional control action with mathematical expression and its characteristics.

(f) Write short note on –(i) ISE (ii) IAE

3) Attempt **ANY TWO** of the following: **(10X2) = 20**

(a) (i) What do you mean by stability? Define stable control system.

(ii) Determine the stability of the system whose characteristic equation is given as-

(b) Sketch the root locus of the system whose open loop transfer function is

$G(s) H(s) = K / s(s+5)(s+10)$

(c) Write Short note on (i) Stepper Motor (ii) Servo Motor

4) Attempt **ANY TWO** of the following: (10X2) = 20

(a) Sketch Bode plot for the following transfer function and determine the gain margin, phase margin.

$G(s) H(s) = 80 / s (20+s)(2+s)$

(b) Sketch the Nyquist plot & decide the stability for $G(s)H(s) = 20/ (s+3)(s^2+2s+2)$

(c) Define the following frequency response specifications.

i) Resonance peak

ii) Bandwidth

iii) Cutoff frequency

iv) gain margin

5) Attempt **ANY TWO** of the following: (10X2) = 20

(a) Design a lag compensator for a system whose open loop transfer function is

$G(s) H(s) = 1 / s(s+1)(0.5s+1)$

it will fulfill following requirement-

(i) Static velocity error constant $= 5sec^{-1}$ (ii) P.M=40º(iii)G.M.=10db

(b) Discuss Integral, Derivative controller with their application, write their advantage & disadvantages also.

(c) Define following terms-

(i) State

(ii) State Variable

(iii) State vector

(iv) State space

(v) State equation

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