Code No. 6098

FACULTY OF ENGINEERING

B.E. 3/4 (ECE) I – Semester (Main) Examination, November 2013

Subject : Automatic Control Systems

Time : 3 hours **Max. Marks : 75**

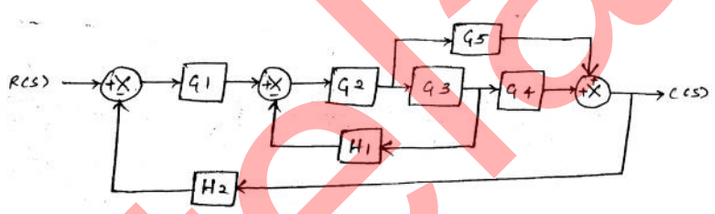
Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. Write the differences between open loop and closed loop systems. (2)
2. Write Mason's gain formula. (2)
3. Given r(t) = $(1 - t^2)$ 3u(t). Find steady state error. (3)
4. Given C.E. as $2s^3 + 3s^2 + 2s + k = 0$. Find the condition for K for the system to be stable. (2)
5. Define Resonant Peak Mr and Resonant frequency Wr. (2)
6. What is principle of Argument? (2)
7. Explain PID controller. (3)
8. Compute state transition matrix when $A = \begin{bmatrix} -1 & 1 \\ 0 & 2 \end{bmatrix}$. (3)
9. Give the advantages of state variable analysis. (3)
10. What is the necessary and sufficient condition for output observability of the system? (3)

PART – B (5 x 10 = 50 Marks)

11. Find the T.F. C(s) / R(s) of the following block diagram. (10)



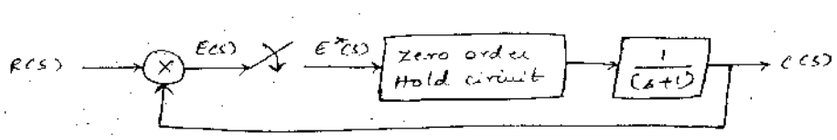
12. Construct the root locus for the given $G(s)H(s) = \dfrac{K}{s(s+4)(s^2+4s+20)}$. (10)

13. Given $G(s) = \dfrac{K}{s(1+0.1s)(1+s)}$. Find the value of K when

    (a) Gain margin = 6 dB (b) Phase margin = 40^0 (5+5)

14. For the system with T.F., $G(s) = \dfrac{400(s+2)}{s^2(s+5)(s+10)}$, draw the Bode plot and (10)
    Obtain gain cross over frequency and phase cross over frequency.

15. For the system shown on figure, find the response at sampling instants to unit step input for T = 1 sec. (10)



16.a) A system is described by the following differential equations. Obtain the state space representation of the system. (6)

$$\frac{d^3x}{dt^3} + 3\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 4x = u_1(t) + 3u_2(t) + 4u_3(t)$$

$$y_1 = 4\frac{dx}{dt} = 3u_1 \,,\; y_2 = \frac{d^2x}{dt^2} + 4u_2 + u_3$$

b) Determine the controllability of the system with X = AX + BU and (4)

$$A = \begin{bmatrix} -0.5 & 0 \\ 0 & -2 \end{bmatrix},\; B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}.$$

17. Write short notes on :
    a) DC servo motor (4)
    b) State transition matrix (3)
    c) Advantages of digital control system (3)

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Estelar