2310

B.E. 6th Semester (Mech. Engg.) Examination,

December–2011

AUTOMATIC CONTROLS

Paper–ME–308–E

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt any **five** questions.*

1. Draw signal flow graph for the following set of equations :-

   (a) $x_2 + 5x_3 - 2x_1 = 0$

   $x_3 + 2x_4 - 4x_2 = 0$

   $x_4 - 8x_3 = 0$ 10

   (b) $x_2 = 4x_1 + 2x_3 + 2x_2$

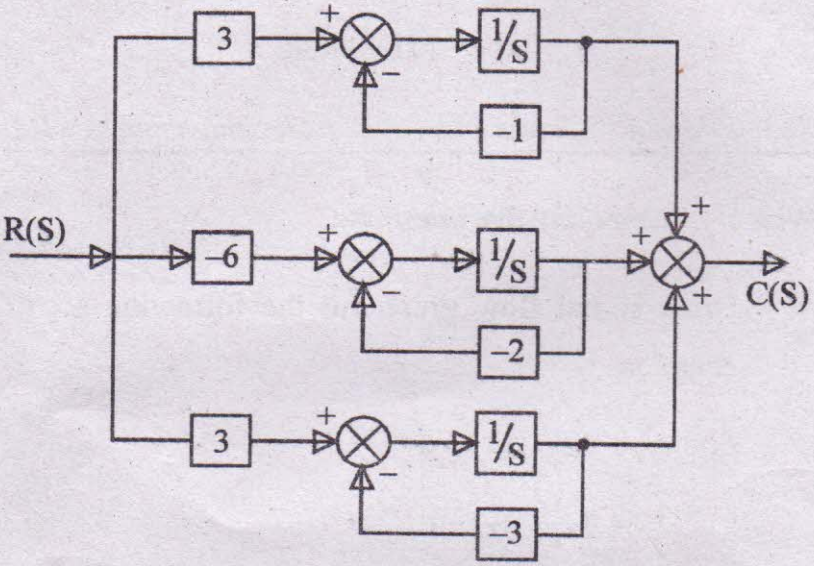
   $x_3 = 6x_1 + 5x_2 + 2x_3$

   $x_4 = 2x_2 + 2x_3$ 10

2. (a) Explain Polar Plot and Bode plot in detail. 15

   (b) Discuss in detail poles and zeros of transfer function. 5

3. Find the transfer functions of the system shown in fig (a). 20



4. (a) Differentiate Proportional-cum. Derivative and propertional-cum-Integral control action. 12

(b) Explain Hydraulic and pneumatic controllers in detail. 8

5. (a) Discuss Masen's Gain formula in detail. 7

(b) Draw signal flow graph for the equations

$$x_1 - x_2 - 2x_3 - 5x_4 = 0$$

$$2x_2 - 3x_3 - 5x_4 = 0$$

$$7x_1 - 3x_3 - 2x_4 = 0$$ 13

6. Apply Routh-Hurwitz criterion to the following equation and investigate the stability

   (a) $S^5 + 2S^4 + 2S^3 + 4S^2 + 11S + 10 = 0$

   (b) $S^5 + S^4 + 2S^3 + 2S^2 + 3S + 5 = 0$ 20

7. The forward path transfer function of a unity feedback system is given by

$$G(S) = \frac{K}{S(S+4)(S+5)}$$

   Sketch the root locus as K varies from zero to infinity. 20

8. Determine the closed loop stability of a control system whose open loop transfer function is

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

   using Nyquist criterion. 20