Roll No. ....

BT-6/J07 **9108**
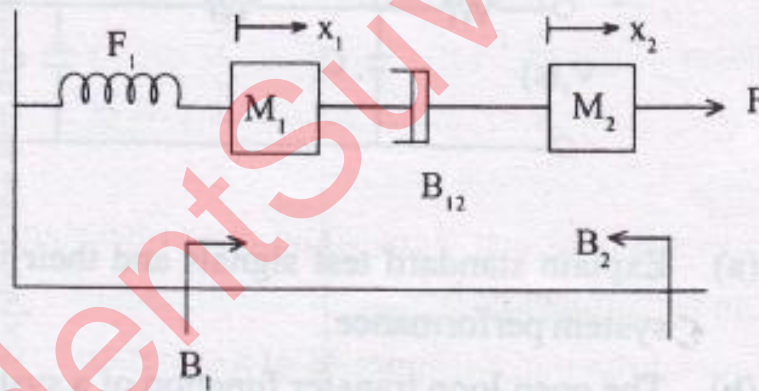
Control System Engg. (2005-06)
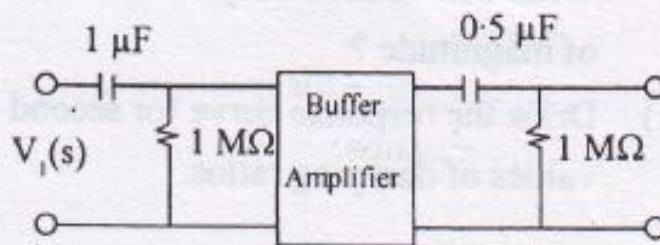
Paper : ECE-302 E

Time : Three Hours] [Maximum Marks : 100

Note :— Attempt any FIVE questions. All the questions carry equal marks.

1. (a) What are open and closed loop systems ? Distinguish between them. 5

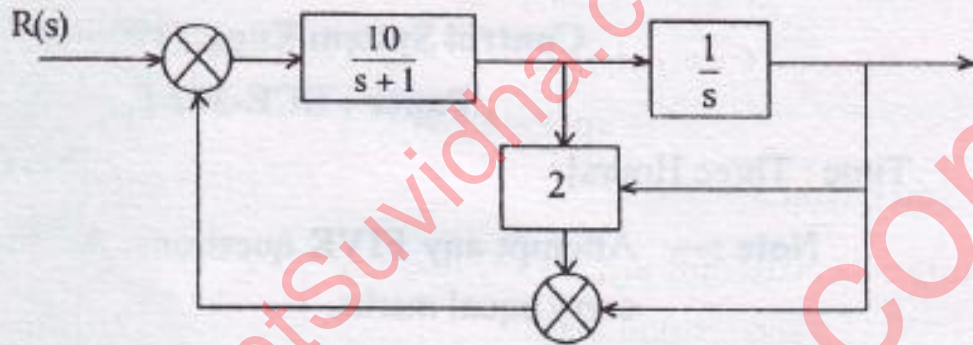   (b) Find the system equations for fig. shown below and obtain f-v analog : 8

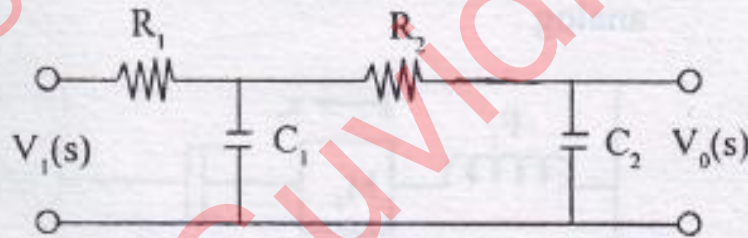   (c) Find $\dfrac{V_0(s)}{V_1(s)}$ for figure shown below : 7

2. (a) Draw the generalised feedback control system. Explain various terms. 6

(b) The block diagram of a system is shown below. Determine the transfer function. 7

R(s) → ⊗ → $\dfrac{10}{s+1}$ → $\dfrac{1}{s}$ →

2

⊗

(c) Draw the Corresponding signal flow graph and obtain T.F. using Mason gain formula. 7

R₁ —WW— R₂ —WW—

V₁(s)   ⊥ C₁   ⊥ C₂ V₀(s)

3. (a) Explain standard test signals and their importance in control system performance. 5

(b) The open loop transfer function of a system is

$$GH(s) = \dfrac{10}{s(s + 2)(s + 5)}.$$

What will be the steady state error when the input signal is step of magnitude ? 7

(c) Draw the response curve for second order system with various values of damping ratios. 8

4. (a) For a second order system with unity feedback $G(s) = \dfrac{200}{s(s+8)}$

find the freq. domain specification. 10

(b) A unity feedback control system is

$$G(s) = \frac{K}{s(s^2 + 4s + 5)(s+2)}.$$

Determine the range of K so that system is stable.   10

5. (a) Express in parallel form

$$G(s) = \frac{5(s+1)}{s(s+2)(s+10)}.$$
    10

(b) Find the dynamic equation of system in matrix form

$$\frac{2d^3 y}{dt^3} + \frac{3d^2 y}{dt^2} + \frac{5dy}{dt} + 2y = x(t).$$
    10

6. Write short notes on :

(a) Phase lead compensation

(b) Feedback compensation.   20

7. (a) Plot the Nyquist stability plot

$$G(s)\,H(s) = \frac{20}{s(1 + 0\cdot 1s)(1 + 0\cdot 5s)}.$$
    15

(b) Discuss the importance of gain margin and phase margin.   5

8. (a) Draw the polar plot and hence determine if the system is stable and its gain and phase margin

$$GH(s) = \frac{12}{s(s+1)(s+2)}.$$
    10

(b) Discuss correlation between time and freq. domain specification.
    10