

GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. - SEMESTER – VI • EXAMINATION – WINTER 2012

Subject code: 160304

Date: 05/01/2013

Subject Name: Bio-Medical Control Theory

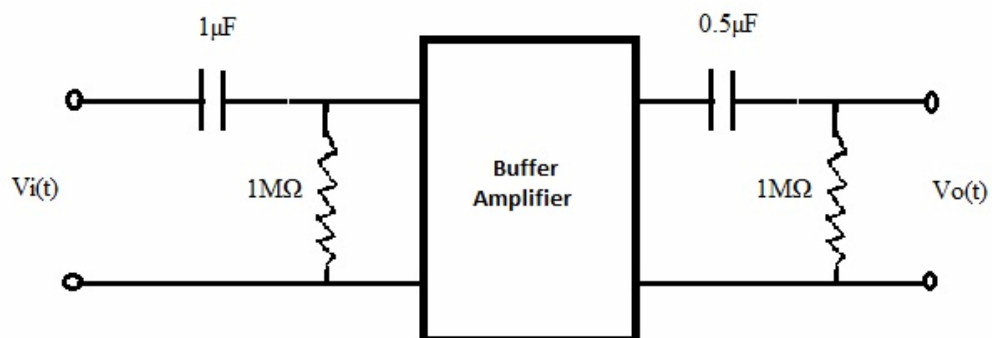
Time: 02.30 pm - 05.00 pm

Total Marks: 70

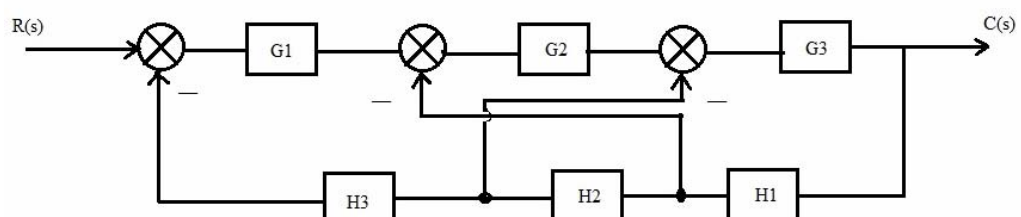
Instructions:

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a) Define following terms 07
1. Disturbance
 2. Feedback
 3. Feed forward system
 4. Servomechanism
 5. Regulating system
 6. Control system
 7. Pole, Zero and Characteristics equation
- (b) Explain open loop and closed loop system with two example of each. 07
- Q.2 (a) Write a short note on “Time Response”. 07
- (b) In RC series network, the value of R and C are $1\text{M}\Omega$ & $1\mu\text{F}$ respectively. Obtain the expression for the current flowing in the circuit if it is supplied with an input of step voltage of 1V at $t=0$ 07
- OR
- (b) Find the $V_o(s)/V_i(s)$, Assume gain of buffer amplifier as 1. 07

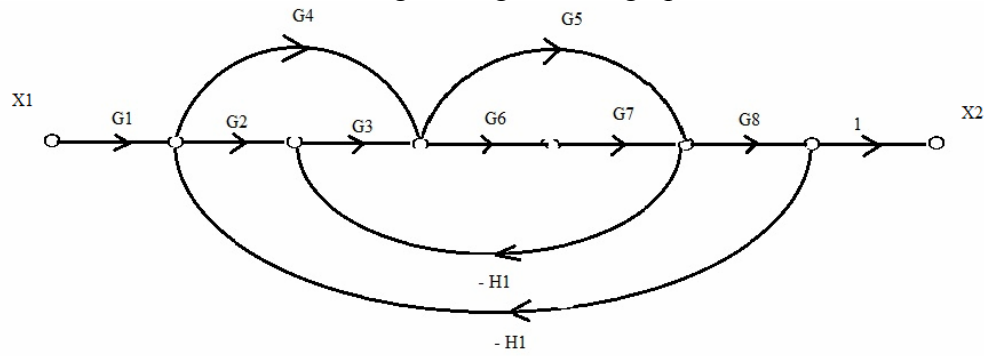


- Q.3 (a) Obtain transfer function for the given system by using block reduction technique. 07



(b) Find the transfer function from given signal flow graph.

07



OR

- Q.3 (a) What is analogous system? Establish force-current and force-voltage analogy. 07
 (b) Find the response of the unit step input on first order system using a suitable example. 07

- Q.4 (a) Derive a equation of unit step response of a second order system for an underdamped case. 07
 (b) The overall transfer function of a unity feedback control system is given by $C(s) / R(s) = 10 / s^2 + 6s + 10$. Find: 1) Position error constant 2) Velocity error constant 3) The steady state error if the input is $r(t) = 1 + t + t^2$ 07

OR

- Q.4 (a) Sketch the root locus for the system having $G(s)H(s) = K / s (s^2 + 4s + 1)$ 07
 (b) For a unity feedback system $G(s) = 800(s + 2) / s^2 (s + 10) (s + 40)$, Sketch the bode plot, Comment on Stability. 07

- Q.5 (a) For a system with characteristic equation $F(s) = s^6 + 3s^5 + 4s^4 + 6s^3 + 5s^2 + 3s + 2 = 0$, examine stability. 07
 (b) Sketch the bode plot for the system having $G(s)H(s) = 512(s + 3) / s (s^2 + 16s + 256)$ 07

OR

- Q.5 (a) Sketch the root locus for the system having $G(s)H(s) = K (s + 4) / s (s^2 + 2s + 2)$ 07
 (b) Sketch the Nyquist plot for system with $G(s)H(s) = (1 + 0.5s) / s^2 (1 + 0.1s) (1 + 0.02s)$, comment on stability 07
