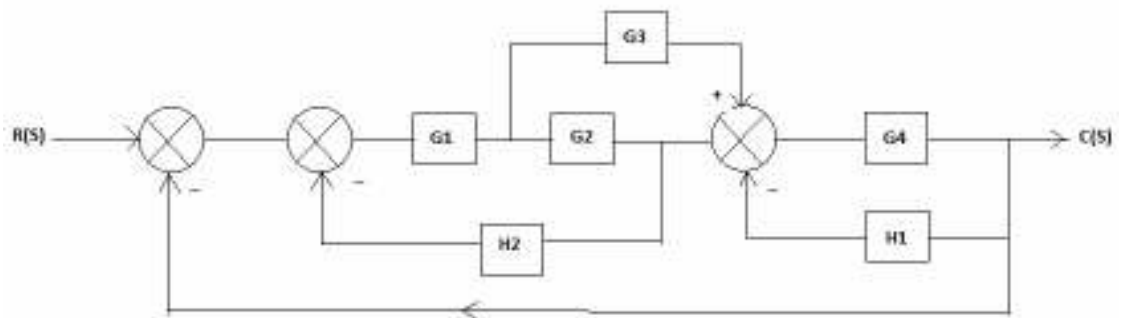


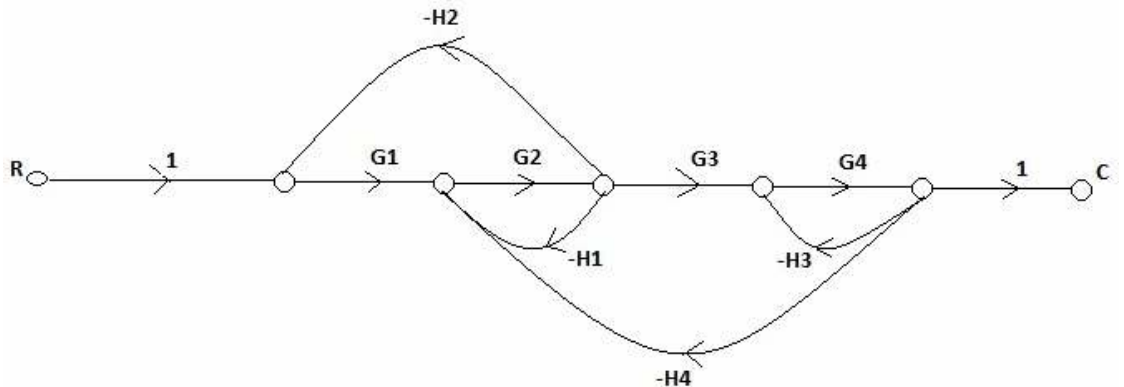
GUJARAT TECHNOLOGICAL UNIVERSITY**B. E. Sem-VI Examination May 2011****Subject code: 160304****Subject Name: Biomedical Control Theory****Date: 21/05/2011****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

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

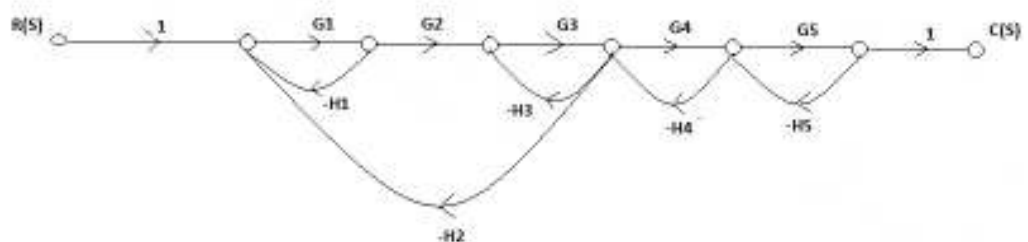
- Q.1** (a) Explain open loop and closed loop control system in detail. 07
 (b) Define following terms 07
 (i) Transfer function (ii) Pole (iii) Zero (iv) Type of System
 (v) Order of system (vi) BIBO Stability (vii) Damping
- Q.2** (a) Obtain $C(s)/R(s)$ using block diagram reduction technique 07



- (b) Obtain transfer function for the given signal flow graph 07

**OR**

- (b) Obtain transfer function for the given signal flow graph 07



- Q.3 (a)** Write short note on Standard Test Inputs. **07**
(b) Find K_p , K_v , K_a and steady state error for a system with open loop transfer function **07**
as:

$$G(s)H(s) = \frac{10(s+2)(s+3)}{s(s+1)(s+5)(s+4)}$$
 where the input is $r(t) = 3 + t + t^2$
OR
- Q.3 (a)** Derive unit step response of a standard second order system for the under damped **07**
case.
(b) For a transfer function **07**

$$Y(s) / X(s) = \frac{8}{s^2 + 4s + 8}$$
 .Determine all time domain specifications for unit step input.
- Q.4 (a)** Sketch the Root locus and comment on stability for the system having **10**

$$Y(s) / X(s) = \frac{k}{s(s^2 + 4s + 1)}$$
- (b)** Draw the Polar plot for the system having $G(s)H(s) = \frac{1}{s(1 + T_1 s)(1 + T_2 s)}$ **04**
- OR**
- Q.4 (a)** Draw the Nyquist plot for the system having **10**
 $G(s)H(s) = K / S^*(S+2)*(S+10)$
- (b)** Draw the Polar plot for the system having **04**

$$G(s)H(s) = \frac{1(1 + T_a s)}{s^2(1 + T_b s)}$$
- Q.5 (a)** Apply Routh's criterion to check the stability of the characteristics equation of system **10**
(i) $P(s) = s^6 + 9s^5 + 20s^4 + 12s^3 + 8s^2 + 16s + 16 = 0$
(ii) $P(s) = s^5 + 6s^4 + 15s^3 + 30s^2 + 44s + 24 = 0$
- (b)** What do you mean by Under damped and Over damped system ? **04**
- OR**
- Q.5 (a)** For a unity feedback system $G(s) = 800(S+2) / S^2*(S + 10)*(S + 40)$. Sketch the Bode **10**
plot and comment on stability.
- (b)** Define (i) State (ii) State variables (iii) State vector (iv) State space **04**
