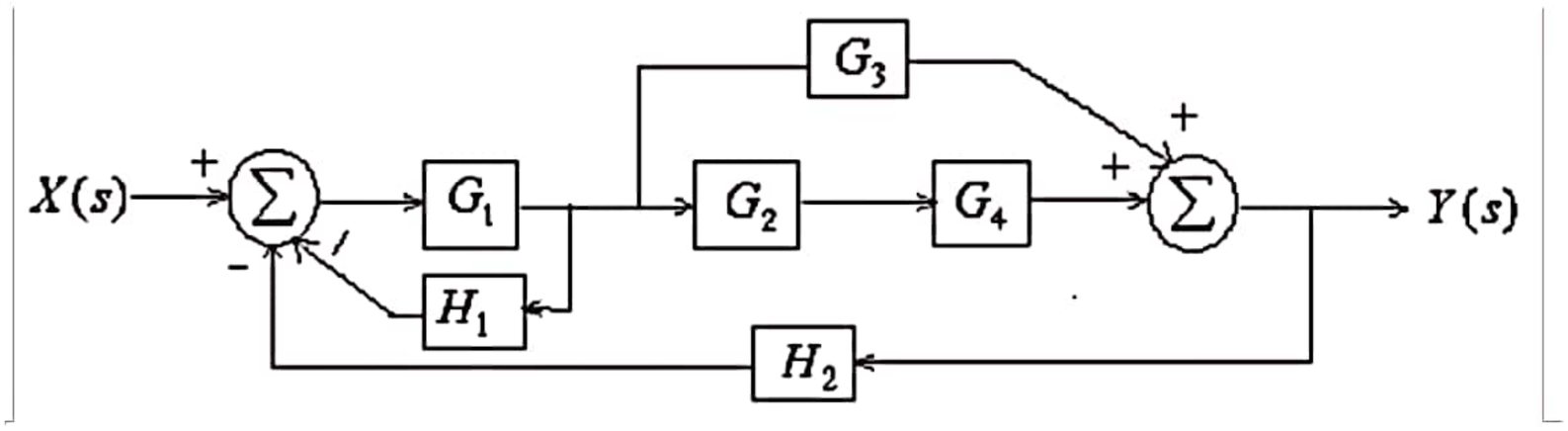
Lab Session 09

Exercise:

Question 1:

For the following multi-loop feedback system, find the closed loop transfer function by successively identifying the basic topologies and reducing it using MATLAB commands as given in Lab 9 in the lab manual.



Where,

$$G_1(s)=\frac{1}{s+10}$$

$$G_2(s)=\frac{1}{s+1}$$

$$G_3(s)=\frac{s^2+1}{(s+2)^2}$$

$$G_4(s)=\frac{s+1}{s+6}$$

$$H_1(s)=\frac{s+1}{s+2}$$

$$H_2(s)=1$$

Write MATLAB script to initialize G1, G2, G3, G4, H1 and H2 variables with the above transfer functions respectively and then identify basic topologies and write commands to reduce successively the above block diagram to arrive at a single transfer function.

Write the evaluated single transfer function below this line. Use A4 sheet to write script and attach it with this document.

FINAL TRANSFER FUNCTION:-

$$G9 = \frac{s^5 + 10s^4 + 28s^3 + 39s^2 + 40s + 20}{s^6 + 25s^5 + 212s^4 + 805s^3 + 1537s^2 + 1444s + 524}$$

PROGRAM SCRIPT:-

```
1- clear, clc
2- G1 = tf (1, [1 10])
3- G2 = tf (1, [1 1])
4- G3 = tf ([1 0 1], conv ([1,2], [1,2]))
5- G4 = tf ([1 1], [1 6])
6- H1 = tf ([1 1], [1 2])
7- H2 = 1

8- % Series configuration b/w G2 and G4
9- G5 = series (G2, G4)
10- % Parallel configuration b/w G3 and G5
11- G6 = parallel (G3, G5)
12- % Feedback configuration b/w G1 and H1
13- G7 = feedback (G1, H1)
14- % Series configuration b/w G7 and G6
15- G8 = series (G7, G6)
16- % Feedback configuration b/w G8 and H2
17- G9 = feedback (G8, H2)
```