Mohit garg

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MID TERM EXAMINATION- B.Tech

SUMMER SEMESTER- JUNE 2018

MAX. MARKS: 50

COURSE CODE: 10B1WEC515

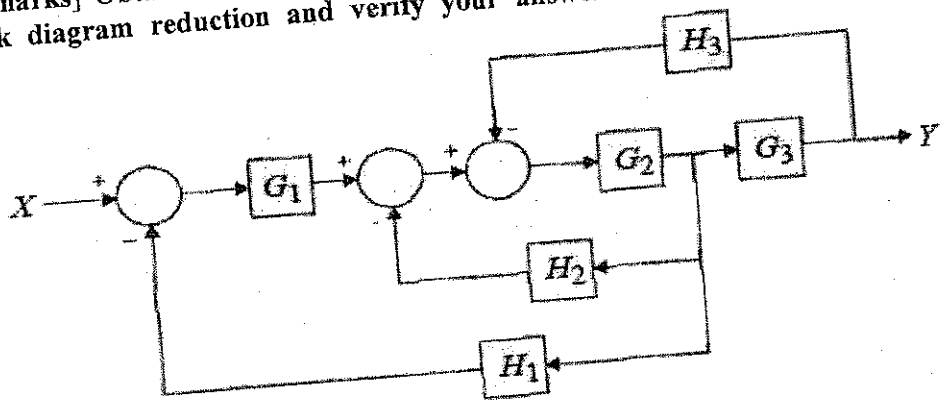
COURSE NAME: **THEORY AND APPLICATION OF CONTROL SYSTEM**

MAX. TIME: 2 Hr

COURSE CREDITS: 4

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

1. **[15 marks] Obtain the overall transfer functions of the following problems using block diagram reduction and verify your answer using Mason's gain formula.**



2. **[15 marks]** Consider the system

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -2 & 3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u;\ y = \begin{bmatrix} 0 & 1 \end{bmatrix} x$$

a. Find the eigenvalues of A and from there determine the stability of the system.
b. Find the transfer function model and from there determine the stability of the system.
c. Are the two results same? If not, why?

3. **[10 marks]** Write Short Notes on:
a) Transfer function vs. State-space approach
b) Mason's gain formulae
c) Open-loop vs. Closed-loop control system
d) Controllability and Observability

4. **[10 marks]** What do you mean by stability of the system? Determine the stability of the following system whose characteristic equation is given below.

$$s^4 + 2s^3 + s^2 + 4s + 2 = 0$$