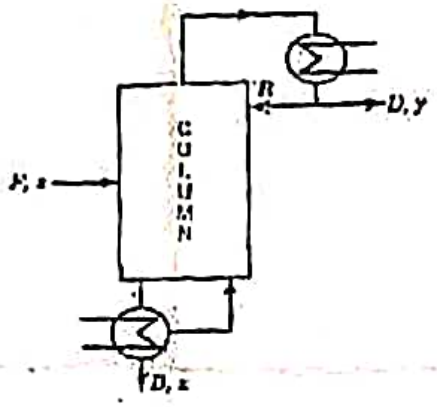
DEPARTMENT OF CHEMICAL ENGINEERING, MNNIT ALLAHABAD

END-SEMESTER EXAMINATION, B.TECH (V SEM), 2018-19

PROCESS DYNAMICS AND CONTROL (CL-1503)

Max. Marks: 60 Time: 3 hrs

1. Define the general stability criterion for a closed loop system. [2]
2. A system has a pair of complex conjugate poles p1,p2= -1±j2, a single zero z1 = -4 and a gain factor K= 3. Frame the differential equation representing the system. [3]
3. Propose and sketch the feed- forward and feed-back controls for Distillation. It is desired to control distillate composition y. All flow rates can be measured and manipulated except F which can be only measured. [3]



4. Find the values of controller gain K_c that make the feedback control system stable. The characteristic equation is $10s^3+17s^2+8s+1+K_c=0$. [4]
5. Consider a second-order system with the following transfer function: [4]

$$G(s)=\frac{Y}{X}=\frac{1}{s^2+s+1}$$

Introduce a step change of magnitude 5 into the system and find: Percent overshoot, Decay ratio, Period of oscillation.

6. Consider a feedback control system with characteristic equation $1+5s+2K_ce^{-s}=0$ Determine the stability limits for the controller gain. [5]
7. Develop the closed loop responses for set point and load changes. [5]
8. What is an inverse response, and what causes it? Discuss the dynamics of a physical system showing such a behavior. [5]
9. Differentiate between the following: [3*2=6]

(i) Reverse and Direct acting proportional controllers

(ii) Proportional and Proportional Integral controller

10. Draw the root locus diagram for the open loop transfer function: [8]

$$G(s) = \frac{k}{(s+1)(s+2)(s+3)}$$

11. What is mathematical modeling? Classify & explain different process models. [5]

12. Derive the modeling equations (Mass and Energy) in case of CSTR. Also mention various assumptions. What are Input variables, Manipulated Variables & Load Variables in this case. [10]