

MECM-105

M. E./M. Tech. (First Semester)

EXAMINATION, Dec., 2011

(Grading/Non-Grading System)

PROCESS MODELING AND SIMULATION

(MECM-105)

Time : Three Hours

Maximum Marks : $\begin{cases} GS: 70 \\ NGS: 100 \end{cases}$

Note : Attempt any four questions. All questions carry equal marks. Make suitable assumption wherever required.

1. (a) Explain the various steps of development of system simulation model.
- (b) What are the basic modeling principles?
- (c) Explain steady state and dynamic simulation with example.
2. (a) What are the different steps of steady state simulation?
- (b) What are the different approaches for steady state simulation? Compare various approaches.
- (c) How are process simulation packages organised?
3. (a) What are the information necessary for solving any flowsheeting problem?

(b) Explain the steps of solving flowsheeting problem with example.

(c) What is Integrated computer aided system?

* Explain application of any simulation package by taking Chemical Engg. examples.

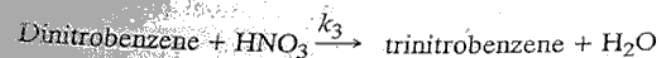
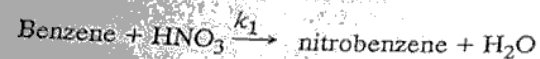
(a) How is modeling and simulation helpful in chemical process design?

(b) Apply basic modeling principles for design of

(i) Heat transfer equipment

(ii) Mass transfer equipment

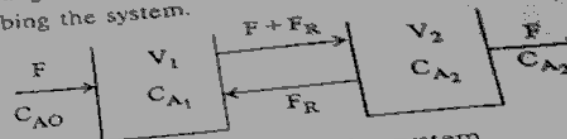
6. Benzene is nitrated in an isothermal CSTR in three sequential irreversible reactions :



Assuming each reaction is linearly dependent on the concentrations of each reactant, derive a dynamic mathematical model of the system. There are two feed stream one pure benzene and one concentrated nitric acid (98 wt.%) assume constant densities and complete miscibility.

7. An isothermal irreversible reaction $A \xrightarrow{k} B$ takes place in the liquid phase in a constant volume reactor. The mixing is not perfect observation of flow patterns indicates that a two tank system with back mixing as shown in figure ahead, should approximate the imperfect mixing.

Assuming F and F_R are constant, write the equations describing the system.



Explain simulation strategy for the system.