Date: 24.03.2014   Max marks: 20
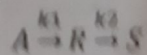
Venue: IV-LT3   Time: 08:00-09:00 am

Q1(a) Give some industrial examples along with the process conditions for each type of different multiple reactions.

(b) Consider an isothermal and first order series reaction as follows:

$$A \xrightarrow{k_1} R \xrightarrow{k_2} S$$

Provide the methodology to establish analogy between fluid flow and reaction engineering to conduct the above stated reaction in a laboratory.   (5)

Q2. The following first-order reaction is taking place in a PBR.

$$A \rightarrow R$$

The reaction rate and the rate constant are given by: $-r_A = k\, p_A$ mol/kg cat-h

$k = 0.75$ mol/atm-kg cat-h

A is fed to the reactor with 50% inerts at $327°C$ and 1 atmosphere. Feed rate of A is 37.5moles/h. The pressure drop parameter $\alpha = 0.0045$kg^{-1}. Obtain an expression that relates the conversion in the reactor to the weight of the catalyst used. What conversion can you obtain with 100 kg of the catalyst?   (5)

Q3. (a) What is the concept of coiled flow inverter (CFI) and what is its potential application?
                                                      (2)

(b) What is the significance of using Coiled flow inverter (CFI) in spite of stirred tank reactors?
                                                      (2)

$N_A = N_{A0}(1-x)$

(c) List the forces acting on fluid flowing through coiled structure (or curved trajectories). Apply force balance on the fluid stream through one coil, when the coil is kept vertical w.r.t. ground.

(2)

Q4 (a) What should be the output of the following commands if executed in a MATLAB command window?

>> x = [1 2 3];   >> x^2   >>x .^2

(b) Write an equivalent command of >> y = linspace (0, 4, 3)

(c) Explain in one line "whos"

(d) What is the difference between the dsolve and ODE45 commands in MATLAB?   (4)