Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

I SEMESTER M.TECH. (CHEMICAL ENGINEERING)

END SEMESTER EXAMINATION, NOV/DEC 2017

SUBJECT: ADVANCED REACTION ENGINEERING [CHE 5103]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** questions.
- Missing data may be suitable assumed.

1.	At present we have 90% conversion of a liquid feed (n=1, C_{A0}= 10 mol/lit) to a PFR with recycle of product (R=3). If we shut off the recycle stream, how much will this lower the processing rate of our feed to the same 90% conversion?	**10**
2A.	Discuss heat effects on effectiveness factor in a gas solid catalytic reaction.	**5**
2B.	The homogeneous gas decomposition of phosphine 4 $PH_3(g)$ -> $P_4(g)$ + $6H_2$ proceeds at 649^0C with the first order rate $-r_{PH_3}$ = (10/hr) C_{PH_3} What size of plug flow reactor operating at 649^0C and 460kPa can produce 80% conversion of a feed consisting of 40 mol of pure phosphine per hour?	**5**
3.	Derive an expression for overall rate for a gas liquid slow reaction with pseudo first order kinetics.	**10**
4.	Derive performance equation for semi batch reactor with reaction A+B->R $-r_A$= k' C_A	**10**
5A	The gas phase reaction 1/2 N_2+ 3/2 H_2 -> NH_3 Is to be carried out isothermally. Molar feed is 50%H_2, 50% N_2 at a pressure of 16.4 atm and 227^0C. For a H_2 conversion of 60% construct a complete stoichiometric table.	**5**
5B.	Derive a performance equation for gas- liquid reaction in a countercurrent spray tower.	**5**