CHEMICAL REACTION ENGINEERING BRANCH: CHEM Max Marks: 100 Time: 3 Hours Q.CODE: HRB221 Swer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III. The figures in the right hand margin indicate marks. Part-I Only Short Answer Type Questions (Answer All-10) Differentiate between elementary and non elementary reactions. Define order and molecularity of a reaction. Write down the difference between space velocity and space time. Write the steps involved in heterogeneous catalytic reactions? Prove that the space time for CSTR in series approaches that of PFR for 1st order reaction. My real reactors deviate from ideal reactors. Differentiate between micro-mixing and macro-mixing. Write the difference between homogeneous and heterogeneous reactions. Write down the performance equation for a batch, plug flow and stirred tank reactor. What do you understand by Arrhenius plot for a reaction? The pyrolysis of ethane proceeds with activation energy of about 70 kcal. How much faster is the decomposition at 600 C than 500 C? A liquid B decomposes by first order kinetics and in a batch reactor 60% B is converted in 10 minutes. How much longer would it take to reach 80% conversion? Write a short note on Arrhenius Theory, Transition state theory and collision theory. A homogeneous liquid phase reaction B→C; -r _A = KC _B ² takes with 50% conversion in a mixed reactor. What will be the conversion if the reactor is replaced by 6 times as large –all else remaining uncharged? What are the methods used to interpret kinetic data from a batch reactor? Bet be the fractional change in volume of the reactor system between no conversion and complete conversion of reactant A. What is the value of S for a reaction A→3B, starting with 50% inerts? Show in a diagram the effect of temperature of equilibrium conversion for endothermic and exothermic reactions.		210					210
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	i)			•			
j) Derive the expression for tri-molecular third order reaction.						liquid phace	
k) In a CSTR 50 % conversion is obtained for a homogeneous, isothermal, liquid phase, irreversible second order reaction. What is the conversion if the reactor volume is 5	K)						
times the original all else remaining unchanged?						i volumo lo o	
I) A(1 st order)→B(1 st order)→C series reaction taking place in a CSTR. Find out the time	I)				ce in a CSTR. Fin	d out the time	
required to get maximum concentration of B. 210 210 210 210		required to get maxim	num concentration	of B. 210	210	210	210

210		210	210	210	210	210	210	210
210	Q3 Q4	210	Only Long Answer Type (A homogenous gas reaction (0.05/min) C _B . What sixe of produce 75% conversion of the rate of a liquid phase independent of concentration of A and B equal to 5 kmol/size and B equal to 5	on B→4R has report plug flow reactor feed consisting of the series of the flow reactor has been also be the flow reactor has been series from the flow reactor has been flow reactor from the flow re	ver Any Two out orted rate at 200 r operating at 200 of 2 g moles of pu he type, A+B→F and equal to 1kmo naving volume 2 r	C with first order C and 4 atmosp ure B per hour? Products; is four I (m³) (min) at 30 m³ with feed conc	here can 210 nd to be 0 K, then entration	(16) 210 (16)
210	Q5	210	equal to 300K. The first order reaction A — flow rate determine the reatherent entering concentration reaction rate is (K) is 0.23 r	actor volume to re when the volume	educe the existin	g concentration to	o 10% of	(16) ²¹⁰
210	Q6		Write short notes on : RTD theory Tank in series model	210	210	210	210	(8) (8) ₂₁₀
210		210	210	210	210	210	210	210
210		210	210	210	210	210	210	210
210		210	210	210	210	210	210	210
210		210	210	210	210	210	210	210