Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

I SEMESTER M.TECH. END SEMESTER EXAMINATIONS

SUBJECT: ADVANCED REACTION ENGINEERING [CHE 5115]

(05/12/2023)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	A PFR of length 4 m and diameter 20 cm is employed to conduct a 1st order reaction ($k = 0.499\ min^{-1}$). A tracer run is conducted and the concentration data is summarized below. Predict the possible conversion employing the Tank in series model.	**08**

t, s	0	5	10	20	30	40	50	60	70	80	90	100
C_{pulse}, mg/lt	0	0.6	1.3	1.5	1.7	3.9	2.7	1.6	1.4	1	0.5	0

1B.	Mention any two important assumptions proposed under Langmuir adsorption isotherm.	**02**
2A.	Find an interim rate expression for the following catalytic reaction when adsorption is controlling. A → B. Assume inhibition to be an added resistance.	**06**
2B.	Visualize and describe the possible steps that could be involved in the kinetics of a trickle bed reactor.	**04**
3A.	Provide reasoning and model an equation to obtain the surface area of a solid.	**06**
3B.	Explain the interphase behavior for gas-liquid contact system.	**04**
4A.	With a neat sketch, relate time and conversion for a constant sized spherical particle, when the controlling resistance is gas film.	**06**
4B.	What is effectiveness factor? Obtain a relationship for a 1st order reaction.	**04**
5A.	Explain in detail the kinetics of a Slurry reactor and how the different resistances are minimized?	**06**
5B.	Qualitatively and quantitatively, assess the Segregation model.	**04**