

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

V SEMESTER B.TECH. (CHEMICAL ENGINEERING)

MAKEUP EXAMINATIONS, DEC 2017

SUBJECT: TRANSPORT PHENOMENA [CHE 3103]

REVISED CREDIT SYSTEM 01/01/2018

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.
- 1. Consider a catalytic reactor in which dimerization reaction $2A \rightarrow A_2$ is carried out, assuming that each catalyst particle is surrounded by stagnant gas film through which 'A' has to diffuse in order to arrive at the catalytic surface, assume the gas film in 10 isothermal condition, derive the concentration profile in the gas film and the molar flux through the film when i) Reaction take place instantaneously ii) The rate at which 'A' disappears at catalyst coated surface as $N_{AZ} = k''C_A = C k'' X_A$ In a gas absorption experiments a viscous fluid flow upward through a smll circular 2. tube and then downward in laminar flow on the outside. Set up a momentum balance over a shell of thickness Λr in the film Velocity istribution iside tube Velocity istributior Aomentu into shell thicknes Δr Aomentun ut of shell thickness <u>A</u>r 10 Gravity force acting on the volume 2πτΔrL aR As shown in figure, note that the momentum in and momentum out arrows are always taken in the positive coordinate direction, even though in this problem the momentum is flowing through the cylindrical surface in the negative r direction. Find velocity distribution in the falling film and obtain an expression for the mass rate of flow in the film. 3. A falling- cylinder viscometer consists of a long vertical container (radius R), capped at both ends, with a solid cylindrical slug (radius kR). The slug is equiped with fins so that its axis is coincident with that of the tube.

