MASTER OF TECHNOLOGY (CHEMICAL ENGINEERING) (CBCS - 2015 COURSE)

M. Tech. (Chemical Engineering) Sem-II :SUMMER- 2022

SUBJECT : CHEMICAL REACTOR ANALYSIS & DESIGN

Day : Thursday
Date : 28-07-2022

S-14180-2022

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Answers to both the sections should be written in **SEPARATE** answer book.

SECTION – I

Q.1 Discuss with example "chemical factors affecting choice of reactor". **[10]**

OR

Derive the equation for optimal batch operation time.

Q.2 Elaborate in detail "Transient and steady state analysis". **[10]**

OR

Give detailed design of slurry reactors.

Q.3 Illustrate multiple steady states with example. **[10]**

OR

Derive the design equation for tubular reactor with heat exchange.

SECTION – II

Q.4 A cooing coil has been located for use in the hydration of propylene oxide. The cooling coil has $3.716 m^2$ of cooling surface and the cooling water flow rate inside the coil is sufficiently large that a constant coolant temperature of 30^0C can be maintained. A typical overall heat transfer coefficient for such a coil is $567.82\ w/m^2\ {}^0C$. Will the reactor satisfy the various constraint of 51^0C maximum temperature if the cooling coil is used? **[10]**

OR

Elaborate unsteady state operation of plug flow reactor.

Q.5 Differentiate between design of fixed bed catalytic reactor at non-isothermal and adiabatic conditions from all aspects. **[10]**

OR

Design the fixed bed catalytic reactor at isothermal condition.

Q.6 A sample of the tracer was injected as a pulse to a reactor and the effluent concentration measured as a function of time, resulting in the following data. **[10]**

T (min)	0	1	2	3	4	5	6	7	8	9	10	12	14
C (g/m^3)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

The measurement represent the exact concentration at the times listed and not average values between the various sampling tests. Construct figures showing C (t) and E (T) as functions of time and determine both the fraction of material leaving the reactor that has spent between 3 and 6 min in the reactor and the fraction of material leaving that has spent between 7.75 and 8.25 min in the reactor.

OR

Give design aspects of reactors with non-ideal flow.

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