

Total No. of Questions : 12]

SEAT No. :

P1093

[Total No. of Pages :3

[4659] - 251

B.E. (Petrochemical Engineering)

C- ELEMENTS OF FLUIDIZATION ENGINEERING

(2008 Course) (Semester - I) (Elective - I) (412404)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

SECTION - I

- Q1)** a) With help of neat sketches explain various regimes of fluidized bed. Explain their applications as well. [10]
- b) Define Fluidization Quality and elaborate all the factors affecting it. [6]

OR

- Q2)** a) Compare the relative advantages and disadvantages of fluidized bed and fixed bed systems. [8]
- b) Obtain the force balance equation for a fluidized bed to calculate minimum fluidization velocity. [8]

- Q3)** A 6 m diameter fluidized bed with $L/D = 4$ is operated for industrial operation. Superficial velocity of gas entering the bed is at 2m/s with a density = 0.8 kg/m³. Overall density of the bed can be considered to be 520 kg/m³. Design a flat plate distributor for the fluidized bed in operation. [16]

Data : C_d can be assumed to be 0.8 for the fluidized bed.

The distributor is made of SS 316L having a thickness of 0.03m.

Wall thickness of the fluidized bed is 5 cm.

OR

P.T.O.

- Q4)** a) With help of neat diagram explain any three types of distributor used in fluidized bed-Highlight their advantages and disadvantages also. [10]
- b) Write a short note on Geldart's classification of particles and their important characteristics. Provides suitable examples. [6]

- Q5)** a) Discuss the pressure drop as a function of gas velocity diagram in details. In this context explain the minimum fluidization velocity and its significance.[9]
- b) What are the difficulties in measurement of multiphase flow. In this context highlight the ideal characteristics of multiphase flow meter. [9]

OR

- Q6)** a) Discuss the effect of pressure on fluidized bed with help of representative examples. [6]
- b) With help of neat sketch explain how the hydrodynamic behaviour of fluidized bed can be mapped using radioactive tracing techniques. [8]
- c) What is agglomeration? How does it affect fluidization performance?[4]

SECTION - II

- Q7)** a) Fluidized bed provides enhanced heat transfer within the bed - Explain with help of mathematical expression. Draw neat sketches to explain the root cause. [8]
- b) Explain the similarities between fluidized bed and a bubble column. [8]

OR

- Q8)** a) Explain the means by which difficult to fluidize particles can be fluidized in better manner. [8]
- b) How can fluidized bed heat transfer be used commercially - Explain with help of suitable examples. [8]

Q9) a) Discuss qualitatively various types of models available for Fluidized bed reactors. [8]

b) With help of suitable diagrams discuss flow of gas through bubbles for slow moving and fast moving bubbles. [8]

OR

Q10)a) With help of important assumptions derive Kunii-Levenspiel model for the bubbling fluidized bed. [10]

b) Write a short note on Davidson's Bubble Cap and bubble movement.[6]

Q11)a) With help of neat diagram explain acrylonitrile manufacturing process utilizing a fluidized bed system. Highlight key issues related with the process. [9]

b) Explain the operation of Fluidized bed Polyethylenes Manufacturing unit with help of schematic diagram - discuss its advantages over the earlier process. [9]

OR

Q12) Write short note on (any three): [18]

a) Scale up issues of Fluidized Bed Systems.

b) Modern FCC Reactors.

c) Chemical Looping Combustion.

d) Freeboard Region and its Utility.

