

B.E./B.TECH. Degree Examination, December 2020

Seventh Semester

**CH16009 FLUIDIZATION ENGINEERING**

(Regulation 2016)

Time: Three hours

Maximum : 80 Marks

Answer **ALL** questions

**PART A - (8 X 2 = 16 marks)**

1. When the flow rate is increased beyond minimum fluidization velocity in a liquid-solid system, smooth, progressive expansion of bed is observed which is called
  - a) Fixed bed
  - b) Expanded bed
  - c) Particulately fluidized bed
  - d) Smoothly fluidized bed
2. Dry sand has the density of 1.6 g/cc and specific gravity of 2.5, then the voidage is
  - a) 0.36
  - b) 0.45
  - c) 0.98
  - d) 1.62
3. The two main factors which affects the fluidization quality are
  - a) Particle size and density
  - b) Size distribution of solids and fluid solid ratio
  - c) Voidage and sphericity
  - d) Superficial velocity and density
4. The kinetic models available for conversion of solids in fluidized bed systems are
  - a) Shrinking core model and Davidson model
  - b) Uniform reaction model and unreacted or shrinking core model
  - c) K-L model and Davison model
  - d) Simple two phase model and Uniform reaction model
5. Depict Geldart classification of particles.
6. Define Froude number. Indicate how it is used to characterize the mode of fluidization.
7. When does one use circulation systems for fluidized bed operations?
8. Mention the significance of apparent mass transfer coefficient.

**PART B - (4 X16 = 64 marks)**

09. (a) (i) Explain the effect of pressure and temperature on bed properties of fluidized bed (6)  
(ii) Analyze different ways of contacting solids and gas streams in a fluidized bed with neat sketches. (10)

**(OR)**

- (b) (i) Explain the applications of fluidized beds in gasification and reforming. (8)  
(ii) Explain briefly the advantages and disadvantages of fluidization. (8)
10. (a) Define minimum fluidization velocity. Derive an expression to obtain the minimum fluidization velocity in case of a fluidized bed. (16)

**(OR)**

- (b) Calculate the minimum fluidization velocity, terminal velocity and mode of fluidization for a bed with following characteristics: (16)  
Particle: - size:100 microns; Density: 20 g/cc  
Fluid: - Viscosity: 0.0081 g/cm.s; Density: 0.95 g/cc.

11. (a) (i) Discuss the design of a fluidized bed system for a fluidized bed catalytic reactor. (8)  
(ii) Discuss how the fluidized bed system is designed for a non-catalytic reactor. (8)

**(OR)**

- (b) Explain shrinking core model for solids of unchanging size with a neat sketch. (16)
12. (a) Discuss how the fluidized bed system is designed for a batch heat transfer operation. (16)

**(OR)**

- (b) (i) Obtain an expression for  $SH_{\text{overall}}$  in terms of  $Sh_t^*$  and  $(K_{bc})_b$ . (8)  
(ii) Explain how the catalytic conversion is determined from the bubbling bed model. (8)