

Total No. of Questions : 12]

SEAT No. :

P4595

[Total No. of Pages : 3

[4957] - 228

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 Q.No. 1 or 2, 3 or 4,5 or 6, 7 or 8, 9 or 10, 11 or 12.*
- 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) What do you understand by Single Particle? Explain the concept in brief. [8]
- b) Explain in detail rate of mixing. [8]

OR

- Q2)** a) What are the various techniques to measure particle size? Explain any one in detail. [8]
- b) Describe with neat sketch various screen analysis methods. [8]

- Q3)** a) A material is crushed in Blake Jaw crusher and the average particle size is reduced from 5 cm to 1.3 cm with consumption of 37 Watts-hr/ton. Calculate the energy required to crush the same material with average particle size from 8 cm to 3 cm by using Rittinger's and kick's laws. Assume mechanical efficiency remains constant. [6]
- b) Enlist various size enlargement processes. Explain any one in brief.[6]
- c) Derive the relationship between critical speed of ball mill with radius of ball mill and radius of ball. [6]

OR

P.T.O.

- Q4)** a) Calculate the power required to crush 100 ton/hr of limestone if 80 percent of the feed passes through a 2 inch screen and 80 percent of the product through a 1/8 inch screen. Data: work index of limestone is 12.74. [6]
- b) Discuss energy utilization in size reduction equipments. [6]
- c) Explain with neat sketch the construction and working of smooth roll crusher. [6]

- Q5)** a) A slurry containing 0.2 kg of solid per kg of water is to be thickened to sludge containing 0.7 kg of solid per kg of water in a continuous settling process. With five different concentration of slurry, the following results were obtained: [8]

Slurry (kg of solid/kg of water)	Sedimentation Rate (m/min)
0.2	0.01
0.235	0.0075
0.266	0.006
0.33	0.0042
0.4	0.0030

What should be the minimum area of thickener to effect a separation at rate of 0.625 kg of solid per second?

- b) Discuss principles involved in sedimentation process with a neat sketch. [8]

OR

- Q6)** a) Explain with neat sketch construction and working of batch thickener. [8]
- b) Explain in detail concept of flocculation. [8]

SECTION - II

- Q7)** a) Discuss principle and working of spouted bed with neat diagram. [8]
- b) Discuss in detail fluidized bed catalytic cracking. [8]

OR

Q8) a) A packed bed of uniform spherical particles of diameter 2.5 mm and density 4150 kg/m^3 is fluidized by means of liquid of density 1000 kg/m^3 and dynamic viscosity 0.001 pa.s . [8]

Calculate

i) Minimum fluidization velocity using Ergun equation

ii) Ratio of settling to fluidization velocity in the bed

Take bed porosity = 0.4

b) With a neat diagram, discuss in detail various fluidization regimes. [8]

Q9) a) A plate and frame press gave a total of 10 m^3 of filtrate in 2000 seconds and 15 m^3 of filtrate in 4200 seconds when the filtration was stopped. Estimate the washing time if 5 m^3 of wash water is used. The resistance of cloth may be neglected and a constant pressure is used throughout. [10]

b) Derive the relation for constant rate and constant pressure filtration for the flow. [8]

OR

Q10)a) Discuss the working of vacuum leaf filter with labeled diagrams. [8]

b) Explain in brief. [10]

i) Filter selection.

ii) Preliminary treatment of slurries before filtration.

Q11)a) Explain with construction and working of magnetic separator. [8]

b) Estimate the terminal settling velocity for 150 to 230 mesh particles of a limestone whose density is 2800 kg/m^3 falling in water at 30°C .

Data : 150 mesh = 0.104 mm, 230 mesh = 0.063 mm, viscosity = 0.801 cp , density of water = 995.7 kg/m^3 . [8]

OR

Q12)a) Describe in detail with neat diagram the principle, construction and working of cyclone separator with advantages, disadvantages and applications. [8]

b) Write a short note on : [8]

i) Capacity and effectiveness of screen.

ii) Liquid washing equipments.

