

06/20/16

SE/IV/CBGS/CHEM/SFMD

Q. P. Code : 573402

Solid Fluid Mechanical Operations

(3 Hours)

34

[Total Marks : 80]

- NB:
- 1) Question no.1 is compulsory
 - 2) Attempt any three from remaining five questions.
 - 3) Assume suitable data if required.
 - 4) Figure to the right indicates full marks.

- Q.1
- a) Write short note on Industrial screening operation. 5
 - b) What rotational speed in revolution per minute, would you recommend for a ball mill 1200 mm in diameter charged with 75 mm ball? 5
 - c) Write short note on combined pressure pneumatic conveying system. 5
 - d) Write short note on Ribbon blender. 5
- Q.2
- a) A crusher is reducing lime stone of crushing strength 70 MN/m^2 from 6 mm diameter size to product size of 0.1 m diameter requires 9 kW. The same machine is used to crush dolomite at the same rate of output from 6 mm diameter size to product which consists of 20% with an average diameter of 0.25 mm, 60% with an average diameter 0.125 mm, and the balance having an average diameter of 0.085 mm. Estimate the power required to drive the crusher, assuming that the crushing strength of dolomite is 100 MN/m^2 and that crushing follows Rittinger's law. 10
 - b) Derive the expression for screen effectiveness. 10
- Q.3
- a) In Context with solids handling and transportation derive Jansen equation. 10
 - b) 1000 ton/day of a metallurgical pulp is thickened from a feed concentration of 200 Kg/m^3 to a underflow concentration of 1500 kg/m^3 by continuous sedimentation. 10

Batch sedimentation data is given below.

Time (hr.)	0.1	0.25	0.5	1.0	2.0	4.0
Pulp height (m)	0.91	0.61	0.43	0.27	0.15	0.08

Calculate the minimum required diameter of the thickener.

Solid density = 4440 kg/m^3

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Q.4 a) A sludge forming a uniform compressible cake is filtered through a filter press out of which one frame is kept under study. At a constant pressure difference of 2.8 kg/cm^2 , a 10 cm cake is formed in one hour with a filtrate volume of 6000 lit. Three minutes are needed to drain liquor from filter. Two minutes are needed to fill the filter with water. Washing proceeds exactly as filtration using 1200 liters. Opening, dumping and closing takes 6 min.

Assume the filtrate has the same properties of wash water and neglect the resistance by cloth and flow line. How many liters of the filtrate is produced in 24 hrs on the average.

- Q.5 b) Discuss minimum fluidization velocity with mathematical expression. 10
a) Derive expression for centrifugal sedimentation. 10
b) Explain the degree of mixing and rate of mixing in case of mixing of dry solids. 10
- Q.6 Write short note on (any four) 20
a) Particulate and Bubbling Fluidization.
b) Plate and frame filter press.
c) Flotation cell
d) Ball mill
e) Muller mixer

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