

(3 Hours)

[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) What are the different particle size analysis techniques? Explain any one. **5**
(b) What are various types of filtration? Derive the equation for constant rate filtration **5**
(c) Calculate the operating speed of the ball mill from the following data: **5**
(i) Diameter of ball mill = 500 mm
(ii) Diameter of ball = 50 mm
Operating speed of ball mill is 35% of critical speed.
(d) Explain Negative pressure pneumatic conveying system **5**
- Q. 2** (a) Explain the working of Ball mill. Derive the expression for critical speed. **10**
(b) A crusher is reducing limestone of crushing strength 70 MN/m^2 from 6 mm diameter size to product size of 0.1 mm 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 contains of 20% with an average diameter of 0.25 mm, 60% with an average diameter of 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**
- Q. 3** (a) Derive the expression for screen effectiveness. **10**
(b) A slurry containing 5 kg of water/ kg of solid is to be thickened to a sludge containing 1.5 kg of water/ kg of solids in a continuous operation. A laboratory test using five different concentrations of slurry yielded the following results: **10**

Conc. (Kg water/kg of solid)	5.0	4.2	3.7	3.1	2.5
Rate of Sedimentation (mm/sec)	0.20	0.12	0.094	0.070	0.052

Calculate the minimum area of the thickener to effect the separation of 1.33 kg/s of solids.

- Q. 4** (a) Explain the construction and working of ribbon blender **10**
(b) Derive the expression to estimate the size of smallest particle that can be separated from cyclone separator **10**

- Q. 5** (a) Explain construction and working of rotary drum filter. **10**
(b) Constant pressure filtration and washing in leaf filter. **10**

An experimental press having an area of 0.0414 m^2 is used to filter an aqueous BaCO_3 slurry at constant pressure of 267 kPa. The filtration equation obtained was

$$t / V = 10.25 \times 10^6 V + 3.4 \times 10^3$$

Where t is in seconds, V in m^3 . If the same slurry and conditions are used in a leaf press having an area of 6.97 m^2 , how long will it take to obtain 1 m^3 of filtration?

- Q. 6** Answer the following questions. (Any Four)
- (a) Low pressure conveying system **5**
(b) Explain Minimum Fluidization velocity. **5**
(c) Short note on Jaw crusher **5**
(d) Short note on Froth Flootation. **5**
(e) Explain leaf filter **5**
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