Solid Fluid mechanical
Operations QP Code : 5538

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(3 Hours) [Total Marks : 80

N.B. : (1) Question No. 1 is compulsory.
(2) Solve any three question from remaining questions.
(3) Figures to the right indicate full marks.

1. Solve the following :-
   (a) Differentiate between ideal and actual screen 5
   (b) Write short note on Cyclone separator. 5
   (c) Write the basic assumptions in Kynch Theory of of sedimentation 5
   (d) List the most important factors on which the rate of filtration depends. 5

2. (a) In fluidization discuss the effect of fluid velocity on pressure gradient and pressure drop 10
   (b) Calculate the minimum area and dianieter of a thickener with a circular basin to treat 0.1 m³/s of slurry of a solids concentration of 150 kglm³. The results of batch settling tests are: . 10

Solid concentration (kg/m³)	Settling velocity (μ m/s)
100.	148
200	91
300	55.33
400	33.25
500	21.40
600	14.50
700	10.29
800	7.38
900	5.56
1000	4.20
1100	3.27

A value of 1290 kg/m³ for underflow concentration was selected from a retention time test. Estimate the underflow volumetric flow rate assuming total separation of all solids and that a clear overflow is obtained.

3. (a) Derive the Ergun equation 10
   (b) Discuss in detail constant rate and constant pressure filtration 10

4. (a) Categorize the Powders in relation to Fluidization Characteristics.   10

   (b) A ball mill, 1.2 mm diameter, is run at 0.80 Hz and it is found that the mill is not   10
working properly. Should any modification in the conditions of operation be
suggested?

5. (a) Classify the Equipments for solids conveying. Explain any one in detail.   10

   (b) Discuss the Particle Separation based on motion of Particles through fluids   10

6 (a) In Context with solids handling and transportation derive Jansen equation.   10

   (b) The collection efficiency of a cyclone is 45 per cent over the size range 0.5 μm   10
80 percent over the size range 5-10 μm and 96 percent for particles exceeding
10 μm Calculate the efficiency of collection for a dust with a mass distribution of
50 percent 0.5 μm, 30 percent 5-10 μm and 20 percent above 10 μm.