SE · Sem - IV (Chem) R · 16/6/14

SE - (Chem) - Sem IV - R (1)

SFMO

Solid fluid Mechanical operations (36)

QP Code : **NP-19883**

(3 Hours) [Total Marks : 80

N. B. : (1) Question No. **1** is **compulsory.**
(2) Answer any **three** questions from **remaining.**
(3) Assume **data** if **necessary** and specify the **assumptions clearly.**

1. (a) Differentiate between open circuit and closed circuit grinding. 5
   (b) Explain froth floatation. 5
   (c) Explain free settling and hindered settling. 5
   (d) Explain filter aids. 5

2. (a) Derive an expression for estimating the screen effectiveness. Discuss the factors on which effectiveness of screen depends. 10
   (b) Calculate the operating speed of a ball mill from the following data :- 10
   (i) Diameter of ball mill = 800 mm
   (ii) Diameter of ball = 60 mm.
   If :-
   (1) Operating speed is 55% less than critical speed.
   (2) Critical speed is 40% more than operating speed.

3. (a) Derive an expression to estimate the size of the smallest particle that can be seperated by cyclone seperator. 10
   (b) Explain the phenomena of fluidisation and explain the types of fluidisation with examples. 10

4. (a) Derive an expression for determination of thickener area. 10
   (b) Caculate the minimum area and diameter of a thickener with a circular basin to treat 0.1 m^3/s of a slurry of solid concentration 150 kg/m^3. 10
   The data is as follows :-

Solid concentration kg/m^3	Settling velocity µm/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

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(2)

The value of 1290 kg/m^3 for underflow concentration was selected from the retention time test. Estimate the underflow volumetric flowrate assuming total seperation of all solids.

5. (a) A plate and frame press filtering a slurry gave a total of 8 m^3 of filtrate in 1800 seconds and 11m^3 in 3600 seconds, when filtration was stopped. Estimate the washing time in seconds if 3m^3 of wash water was used. The resistance of the cloth can be neglected and a constant pressure is used throughout. 10

(b) Explain the working principle of Rotary Filtration Unit. 10

6. (a) The performance of a solid mixer has been assessed by calculating the variance occuring in weight fraction of a component amongst a selection of samples withdrawn from the mixture. The quality was tested at intervals of 30 secs. and the results are :- 10

Sample variance	0.025	0.006	0.015	0.018	0.019
Mixing time (sec)	30	60	90	120	150

If the component analysed is estimated to represent 20% of the mixture by weight and each of the sainple removed contained 100 particles. Comment on the quality of the mixture produced.

(b) Write short notes on (any two) :- 10

(i) Belt conveyor

(ii) Elevators

(iii) Pneumatic conveyors.