Paper / Subject Code: 40304 / Solid Fluid Mechanical Operations (SFMO)

13-Dec-2019   1T00524 - S.E.(Chemical Engineering)(SEM-IV)(Choice Based) / 40304 - Solid Fluid Mechanical Operations (SFMO)   68926

[Time: 3 Hours]   [Marks: 80]

Please check whether you have got the right question paper.

N.B: 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) Explain in brief different particle size measurement techniques   **(05)**
B) Write short note on Muller Mixer.   **(05)**
C) Write short note on Elutriation.   **(05)**
D) What is minimum fluidization velocity?   **(05)**

Q. 2 A) If crushing rolls, 1 m in diameter, are set so that the crushing surfaces are 12.5 mm apart **(10)**
and the angle of nip is 31°, what is the maximum size of particle which should be fed to
the rolls? If the actual capacity of the machine is 12 % of the theoretical, calculate the
throughput in Kg/sec when running at 2.0 Hz if the working face of the roll is 0.4 m long
and the bulk density of the feed is 2500 kg/m3

B) Derive the expression for screen effectiveness   **(10)**

Q. 3 A) A slurry containing 5 kg of water/ kg of solid is to be thickened to a sludge containing 1.5 **(10)**
kg of water/ kg of solids in a continuous operation. A laboratory test using five different
concentrations of slurry yielded the following results:

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.

B) Discuss constant pressure filtration and constant rate filtration.   **(10)**

Q. 4 A) Derive the expression to estimate the size of smallest particle that can be separated in **(10)**
Cyclone separator.
B) Discuss conditions for Fluidization in details.   **(10)**

Q. 5 A) Discuss Blake Jaw Crusher in detail   **(10)**
B) A sample of pyrite was screened. The screen analysis is given below.   **(10)**
i.   Calculate the mean surface diameter. Specific Gravity of pyrite is 5.0
ii.   Find specific surface

Mesh	8/10	10/14	14/20	20/28	28/35	38/48	48/65
Mass fraction retained	0	21.2	19.6	17.4	14	15.8	12
Aperture, mm	1.651	1.168	0.833	0.589	0.417	0.295	0.208

Q. 6 A) Write short note on: i) Bag Filter   ii) Belt conveyor   **(10)**

B) The performance of the solid mixer has been assessed by calculating the variance **(10)**
occurring in weight fractions of a component amongst a selection of samples withdrawn
from mixture. The quality was tested at intervals of 320 sec and the results are:

Sample variance	0.025	0.006	0.015	0.019
Mixing Time	30	60	90	150

If the component analysed is estimated to represent 20% of the mixture by weight
and each sample removed contained 100 particles. Comment on the quality of the
mixture produced and present the data in graphical form showing variation and mixing
index with time

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