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SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | | **Total number of pages:[2]**

Total number of questions:06

B.Tech. || CHE || 3rd Sem

Mechanical Operations

Subject Code: BTCH-301A

Paper ID: (for office use)

Time allowed: 3 Hrs **Max Marks: 60**

Important Instructions:

- **All questions are compulsory**
- **Assume any missing data**

PART A (2×10)

Q. 1. Short-Answer Questions: All COs

(a) What is meant by the term Sauter mean diameter and sphericity?
(b) Enlist the types of conveyors used industrially.
(c) Differentiate between paddles and propellers.
(d) Define power number. How can you find the power requirement of an agitator?
(e) What are filter aids? What is cake compressibility?
(f) Give the important uses of fluidization.
(g) What do you understand by free and hindered settling?
(h) Define terminal velocity. Give a relation to find terminal velocity.
(i) Differentiate between clarification and classification.
(j) What is meant by mixing index?

PART B (8×5)

Q. 2. a) What is particle size distribution? Derive a relation for mean surface diameter and specific number of particles. CO1

b) Discuss about the important characteristics of solids. Why is the bulk density lower than the true density?

OR

The following screen analysis applies to a crushed solid: CO1

Aperture Size in mm	through 6	on 4	on 2	on 0.75	on 0.50	on 0.25	on 0.125	through 0.125
% no. product	100	26	20	21	8	17	3	5

Calculate its Sauter mean diameter and mass mean diameter.

Q. 3. With the help of a neat sketch, describe the principle and working of a ball mill. What is meant by critical speed for a ball mill? CO2

OR

If crushing rolls 1 m in diameter are set so that the crushing surfaces are 12.5 mm apart 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 15% of the theoretical, CO2

calculate the throughput in kg/s when running at 2 Hz if the working face of the rolls is 0.4 m long and the feed density is 2500 kg/m^3?

Q. 4. With a neat sketch, explain in detail the working of a plate and frame filter press. What is simple washing and thorough washing? CO3

OR

A sludge is filtered in a plate and frame filter press fitted with 25mm frames. For the first 10 min, the slurry pump runs at maximum capacity. During this period, pressure difference rises to 500kN/m^2 and a quarter of the total filtrate is obtained. The filtration further takes 1hr. to complete at constant pressure and 15min to empty and reset the press. It is found that if the clothes are precoated with a filter aid of depth 1.6mm, the cloth resistance reduces to 1/4th of original value. What will be the increase in throughput of the press if the precoat requires 3min for it's application. CO3

Q. 5. a) Explain the difference between the sink and float method and differential method of classification. CO3

b) Under what conditions baffled and unbaffled tanks are used? How is the power requirement in the two cases calculated?

OR

What will be the terminal velocity of a steel spherical particle, 0.40 mm diameter, settling in oil of sp. gr. 0.82 and viscosity 10 cP. The sp. gr. of steel is 7.87. CO3

Q. 6. What is minimum fluidization velocity? Derive the relation for minimum fluidization velocity from Ergun's equation. How is the minimum fluidization velocity related to operating fluidization velocity? CO4

OR

Derive Ergun's equation for pressure drop across a bed for flow of fluid through a bed of granular particles. CO4