



KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS EXAM MALPRACTICE

General Instructions: Assume any data if found missing, with suitable justifications.

Answer any TEN Questions

(10 X 10 = 100 Marks)

1. How are industrial screens are classified. Explain the construction and working principles of any three industrial screens with neat diagram.

2. The screen analysis shown in the following table applies to a sample of crushed quartz. The density of the particles is 2650 kg/m^3 and the shape factors are $a = 2$, sphericity = 0.571. For the material between 4-mesh and 200-mesh in particle size, calculate:

(a) A_w in mm^2/gm and N_w in particles /gm

(b) D_v - volume mean diameter

(c) D_s - volume surface mean diameter

(d) D_w - mass mean diameter

(e) N_w - for the 150/200 mesh increment

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ON TELEGRAM TO JOIN



Mesh no.	Screen Opening D_{pi} , mm	Mass fraction retained, x_i
4	4.699	0.00
6	3.327	0.0251
8	2.362	0.1250
10	1.651	0.3207
14	1.168	0.2570
20	0.833	0.1590
28	0.589	0.0538
35	0.417	0.0210
48	0.295	0.0102
65	0.208	0.0077
100	0.147	0.0058
150	0.104	0.0041
200	0.074	0.0031
pan	-	0.0075

3. Discuss in detail about methods of material handling and storage of particles in industries. Also elucidate problems faced while designing the storage vessels.

4. A certain set of crushing rolls has rolls of 150 cm in diameter by 50 cm width of face. They are set so that the crushing surfaces are 1.25 cm apart at the narrowest point. The manufacturer recommends 100 rpm, as the roll speed. They are to crush a rock having a specific gravity of 2.35 and the angle of nip is 30°

a) What are the maximum permissible size of feed and the maximum actual capacity in metric tons per hour if the actual capacity is 12% of the theoretical?

b) After long use, the tires on the rolls of the mill have become roughened so that the angle of nip is 32° . What will now be the maximum permissible size of feed and the capacity of the rolls?

5. a) Discuss in detail about open circuit and closed circuit grinding operation with neat diagram. [5]

b) Define critical speed of the ball mill and derive the relation. [5]

6. Crushed limestone particles mixed with water are allowed to settle at the bottom of the tank.

a) Estimate the terminal velocity for 80 to 100 mesh particles of limestone ($\rho_p = 2800 \text{ kg/m}^3$) falling in water at 30°C .

b) Calculate velocity in centrifugal separator when the acceleration is $50g$?

Date: D_p for 100 mesh = 0.147 mm

D_p for 80 mesh = 0.175 mm

Viscosity of water = 0.801 cP and

Density of water = 995.7 kg/m^3

N_{Re}	C_0
2.5	20
5	14
40	4.1

7. Discuss in detail about construction and working principles of cyclone separator with neat diagram. Also calculate the standard sizes of the cyclone separator whose diameter of cylindrical portion is 5m .

8. Explain the importance of separation techniques and what separation techniques would you suggest economically to separate drug solids in API pharmaceutical industry? Also explain its construction and working principle with neat diagram.

9. Discuss the principles of flotation and explain importance of flotation reagents on separation of solids. Also explain the principle of any two industrial flotation equipment.

10. Laboratory filtration conducted at constant pressure drop on slurry of CaCO_3 in water gave the data shown in table. The filter area was 220 cm^2 , the mass of solids per unit volume of filtrate was 11.75 g/L , and the temperature was 25°C . Evaluate the specific cake resistance and filter medium resistance as a function of pressure drop. Fit empirical equation of α in terms of Δp .

Filtrate volume, (V)	$\Delta p: 16.2 \text{ lb}_f/\text{ft}^2$	$\Delta p: 28.2 \text{ lb}_f/\text{ft}^2$	$\Delta p: 49.1 \text{ lb}_f/\text{ft}^2$
	Time (s)	Time (s)	Time (s)
0.5	6.8	6.3	4.4
1.0	19	14	9.5
1.5	34.6	24.2	16.3
2.0	53.4	37	24.6
2.5	76	51.7	34.7
3.0	102	69	46.1
3.5	131.2	88.8	59
4.0	163	110	73
4.5	-	134	89.4
5.0	-	160	107.3

11. List five factors affecting the filtration rate in continuous filtration. With neat diagram, explain the construction and working principles of Rotary drum filter.

