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SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)
(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)
FOURTH SEMESTER B.TECH DEGREE EXAMINATION (S), AUGUST 2023
CHEMICAL ENGINEERING
(2020 SCHEME)

Course Code:	**20CHT206**
Course Name:	**Particle Technology**
Max. Marks:	**100**

Duration: 3 Hours

PART A
(Answer all questions. Each question carries 3 marks)

1. Differentiate between cumulative and differential methods of analysis for particle size distribution.

2. What are the factors affecting effectiveness and capacity of screening?

3. State principle of froth flotation.

4. Define magnetic separation of particles.

5. What do you mean by closed circuit grinding and open circuit grinding?

6. State why centrifuging is not desirable in ball mill?

7. State the characteristics of filter medium.

8. Explain briefly the terms: constant rate filtration and constant pressure filtration.

9. What do you mean by kneaders? Write the types, uses and functions of kneader while mixing.

10. Write short notes on silos, bins and hoppers.

PART B
(Answer one full question from each module, each question carries 14marks)
MODULE I

11. a) Write short note on different sub-sieve analysis techniques. (7)
    b) A dolomite mixture having the following screen analysis is screened through a standard 100 mesh screen. Calculate the effectiveness of the screen and the mass ratios of overflow and underflow to feed. (7)

Screen Analysis:

Mesh	Feed weight retained in g	Oversize weight retained in g	Undersize weight retained in g
35	7.07	13.67	0.00
48	16.60	32.09	0.00
65	14.02	27.12	0.00
100	11.82	20.70	2.32
150	9.07	4.35	14.32
200	7.62	2.07	13.34
-200	33.80	0.00	70.02
	100	100	100

OR

12. a) Write short note on different types of industrial screens. (4)

     b) Finely divided clay is used as a catalyst in the petroleum industry. (10) It has a density of 1.2 g/cc and a sphericity of 0.5. The size analysis is as follows.

BSS No.	Screen Diameter (mm)	Mass of particles retained on screen (g)
12	1.7	29.6
18	1.04	13.7
25	0.71	5.7
60	0.25	199.6
85	0.1725	84.9
100	0.15	35
Pan	--	129.2

Find the specific surface area, Sauter mean diameter and mass mean diameter of the clay material.

MODULE II

13. a) Explain briefly about the mechanical classifiers and its different types with a neat sketch. (10)

     b) Write in detail about the separation of solid particles based on their electrical properties. (4)

OR

14. Explain in detail about the principle and design of a continuous thickener. (14)

MODULE III

15. a) A sample of material is crushed in a Blake jaw crusher such that the average size of particles is reduced from 50 mm to 10 mm with (7)

the energy consumption of 13 kW/(Kg/s). Determine the consumption of energy to crush the same material of 75 mm average size to an average size of 25 mm using Rittinger's and Kick's laws.

b) What is meant by critical speed of a ball mill and calculate the operating speed of the ball mill from the data given below: (7)

Diameter of ball mill = 800 mm, diameter of ball = 60 mm

    (i)   Operating speed is 55 % less than the critical speed.

    (ii)   Critical speed is 40% more than the operating speed.

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OR

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16. a) Explain in detail about the different types of size reduction equipment's with its neat sketches. (10)

    b) What will be the power required to crush 150 tonnes per hour of lime stone, if 80 percent of the feed passes 50 mm screen and 80 percent of product passes 3.125 mm screen? Work index of lime stone = 12.74. (4)

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MODULE IV

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17. a) A plate and frame filter press when filtering a sludge have 8 m^3 of filtrate in 1800 seconds and 11 m^3 of filtrate in 3600 seconds when filtration was stopped. Calculate the washing time if 3 m^3 of wash water is used to wash the cake. Neglect the resistance of the filter cloth. Assume constant pressure filtration. (9)

Data Given: Rate of washing = ¼(final rate of filtration)

    b) Briefly explain the working and principle of centrifugal filtration with a neat sketch. (5)

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18. a) Classify filtration equipments and explain the working of any three equipments with neat sketches. (10)

    b) Differentiate sedimentation and filtration based on its principle. (4)

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MODULE V

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19. a) What are the different types of conveyors used for the transportation of solids? (4)

    b) Explain the working, selection and advantages of each type of conveyor in detail with neat sketches. (10)

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OR

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20. Explain the working of any four-air separation (gas cleaning) techniques in detail with neat sketches. (14)

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