

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FOURTH SEMESTER B.TECH DEGREE EXAMINATION (Regular), JULY 2022

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. List out the different methods used for particle size measurements. Also specify in which size range they are used.
2. Derive the expression for volume surface mean diameter.
3. What are the different types of reagents used in the froth floatation process with examples?
4. Explain the principle of operation of mechanical classifier.
5. List out the factors affecting the comminution.
6. Explain centrifuging in the ball mill. What are the consequences of centrifuging?
7. Write the expression for specific cake resistance.
8. Write the classification of centrifugal filters.
9. Name the different types of belt conveyors used in the industry.
10. Explain the significance of mixing index.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Calculate the sphericity of a cylindrical particle having length is equal to its diameter of 3 cm. (7)
- b) Discuss the methods of reporting sieve analysis data. Give the factors affecting screen effectiveness. (7)

OR

12. a) Discuss the classification of industrial screen. With neat diagram explain the working of trommel screen. (7)
- b) Develop the overall material balance over the screen and derive the equation for overall effectiveness. (7)

MODULE II

13. a) Explain the classification of floatation equipment based on generation and introduction of air bubble. With neat diagram explain the mechanical (7)

floatation cell.

- b) A slurry containing 5 kg of water per kg of solids is to be thickened to a sludge containing 1.5 kg of water per kg of solids in a continuous operation. Laboratory test using five different concentration of the slurry yielded the following data. Calculate the minimum area of thickener required to effect the separation of a flow of 1.33 kg/s of solids. (7)

Concentration (kg water/kg solid)	5.0	4.2	3.7	3.1	2.5
Rate of sedimentation (mm/s)	0.2	0.12	0.094	0.070	0.050

OR

14. a) Explain the process of sedimentation and derive an expression for calculating the minimum thickener area required by a batch sedimentation test. (7)
- b) Derive the equation for the terminal settling velocity of a particle in Stokes law and Newton's law range (7)

MODULE III

15. a) Calculate the operating speed of the ball mill from following data.
Dia of the ball mill = 500 mm (7)
Dia of the ball = 50 mm
Operating speed of ball mill is 35% of critical speed.
- b) With help of neat sketch explain the working of a conical ball mill and write its application. (7)

OR

16. a) What is the power required to crush 100 Ton/hr of limestone if 80% of the feed passes a 2 inch screen and 80% of the product (1/8) inch screen? The work index of limestone is 12.74. (7)
- b) Derive an expression between particle size, roll dimensions and angle of nip in smooth roll crusher. (7)

MODULE IV

17. a) What are the various factors which affect the rate of filtration? Derive the expression to calculate the rate of filtration. (7)
- b) A plate and frame filter press is used to filter a known slurry mixture. At constant pressure drop of 0.7 kg/cm², 1400 lit of filtrate is delivered in 10 min starting with a clean filter. In a second run with the same slurry and filter press, 1140 lit of filtrate is obtained in 9 min when the pressure drop is 0.42 kg/cm² starting with a clean filter. What is the compressibility exponent for the cake if the resistance of the filter medium is negligible? (7)

OR

18. a) Enlist the factors to be considered while selecting the filtration equipment. Select a suitable filter for the manufacture of phosphoric acid plant. Justify your answer. (7)
- b) Explain the principles of cake filtration and the type of cake filtration. With neat diagram explain the working of leaf filter. (7)

MODULE V

19. a) List out the major accessories of belt conveyor. Explain its function. (7)
b) Select a suitable conveying system for the transportation of sulphur from the barge to the storage silo. Explain the system with neat diagram. (7)

OR

20. a) Select a suitable gas cleaning system in a modern cement plant. With neat diagram explain the working. (7)
b) Discuss the classification of mixing equipment. Select a suitable type for mixing of polymer material. (7)
