

10995 : Chemical Engineering Operations-I (Mechanical Operations) : 4 CH 05

P. Pages : 2

Time : Three Hours

**AW - 3068**

Max. Marks : 80

- Notes :
1. Answer **three** question from Section A and **three** question from Section B.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Diagrams and chemicals equations should be given wherever necessary.
 5. Illustrate your answer necessary with the help of neat sketches.
 6. Discuss the reaction, mechanism wherever necessary.
 7. Cell phone is not allowed.
 8. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. a) Explain the following laws of size reduction:- 7
i) Rittinger's law ii) Kick law
iii) Bond's law and work Index.

- b) Explain in detail the capacity and effectiveness of screen. 7

OR

2. a) Explain in detail the principle, construction and working of blake Jaw crusher with the help of neat sketch diagram. 7

- b) Calculate the operating speed of ball mill from the following data:- 7

i) Diameter of ball mill = 800 mm

ii) Diameter of ball = 60 mm

If 1) Operating speed is 55% less than critical speed

2) Critical speed is 40% more than operating speed.

3. a) Explain in detail the principle, construction and working mechanism of double cone classifier with the help of neat sketch diagram. 6

- b) What should be the settling velocity of a spherical particle of 0.4 mm diameter in an oil of specific gravity 0.82 and viscosity 10^{-3} N.s / m². The specific gravity of steel is 7.87. 7

OR

4. a) Discuss in detail the calculation of area of continuous thickner from a simple batch test by Kynch method. 7

- b) Explain the construction and working of continuous thickner. Also give the various zones in continuous thickner. 6

5. a) Explain the construction and working of belt conveyer with the help of followings:- 7

i) Belt material ii) Belt Drive Arrangement

iii) Material feeding and discharge arrangement

- b) Discuss the properties and significance of followings with the help of neat sketch diagram:- 6
- i) Impeller ii) Paddles iii) Turbines

OR

6. a) Define the term 'Mixing Index' and Degree of mixing. Explain the construction and working of Banbury mixer. 7
- b) What is the principle of operation of screw conveyor? Discuss the relative merits and demerits of screw conveyor. 6

SECTION – B

7. a) What are the various factors to be considered while selecting the filter media? Discuss the compressible and incompressible cake. 7
- b) What are pressure filters? Discuss the advantages and disadvantages of plate and frame filter press. 7

OR

8. a) What is the principle of filtration? Derive the equation for constant rate and constant pressure filtration. 7
- b) Explain in detail the construction and working of rotary drum filter with the help of neat sketch diagram. 7
9. a) Explain the principle, construction and working of Hydroclone. 7
- b) Discuss the construction, working and calculation of magnitude, pressure and stress developed in centrifuge. 6

OR

10. a) A centrifuge with phosphor bronze basket 375 mm diameter is to be run at 60 Hz with a 75mm layer of liquid of specific gravity 1.2 in the basket. What thickness of walls is required in the basket. 7
Density of phosphor bronze = 8900 kg/m^3 .
Maximum safe working stress for phosphor bronze = 55 MN/m^2 .
- b) Critically compare centrifugation with sedimentation. 6
11. a) Define the term 'Adsorption' Explain the characteristics of good adsorbents and their applications on commercial level with the help of suitable examples. 7
- b) Derive the Langmuir and Freundlich equation for adsorption isotherm. 6

OR

12. a) Explain the adsorption in fixed bed and fluidized bed with application. 7
- b) Discuss the thermal and pressure swing adsorption. 6
