

# CBCS SCHEME

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21BT32

## Third Semester B.E. Degree Examination, Dec.2023/Jan,2024 Unit Operations

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Define fluid. Explain the rheological behavior fluid. (10 Marks)  
b. Derive barometric equation. (10 Marks)

OR

- 2 a. State and derive Bernoulli's equation state the assumptions. (10 Marks)  
b. What are cyclones? Explain the working of cyclones with a neat sketch. (10 Marks)

### Module-2

- 3 a. Define the laws of crushing and explain the working of ball mill. (10 Marks)  
b. Acetic acid flows through a 75mm internal diameter pipe at a rate of  $0.015\text{m}^3/\text{s}$ . Calculate the pressure drop in the horizontal pipe of length 70m.  
Viscosity of acid =  $2.5 \times 10^{-3}\text{N-s/m}^2$   
Density of acid =  $1060\text{kg/m}^3$ . (10 Marks)

OR

- 4 a. With a neat sketch, explain the principle and working of venturimeter. (10 Marks)  
b. Describe the construction and working of plate and frame filter press with a neat diagram. (10 Marks)

### Module-3

- 5 a. Derive the equation for overall heat transfer coefficient by stating all the assumptions. (12 Marks)  
b. A wall is made of brick of thermal conductivity  $1\text{W/mK}$ , 230mm thick. It is lined on the inner face with plaster of thermal conductivity  $0.4\text{W/mK}$  and of thickness 10mm. If a temperature difference of 30K is maintained between the two faces, what is the heat flow per unit area of wall? (08 Marks)

OR

- 6 a. Develop an equation for heat conduction through a composite plane wall. (10 Marks)  
b. Explain the fluid flow patterns in a heat exchanger. (04 Marks)  
c. Describe the concept of LMTD for various flow types in a STHE. (06 Marks)

### Module-4

- 7 a. Define Fick's law of diffusion. Derive an expression for steady state diffusion in gases (equimolar counter current) condition. (10 Marks)  
b. Explain the concept of molecular diffusion in liquids. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 a. What is diffusivity? Show that  $N_A = J_A + X_A(N_A + N_B)$ . (10 Marks)  
b. Show that for equimolar counter diffusion  $D_{AB} = D_{BA}$ . (10 Marks)

Module-5

- 9 a. Describe the principle and working of any two stage extractor in detail. (10 Marks)  
b. What is meant by distillation? Explain the methods of distillation in detail. (10 Marks)

OR

- 10 a. Explain the concept of liquid – liquid extraction in detail. (10 Marks)  
b. Describe the process of drying. Differentiate between batch and continuous drying. (10 Marks)

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