

# CBCS Scheme

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15BT32

Third Semester B.E. Degree Examination, June/July 2018

## Unit Operation

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Define Fluid. Explain the different types of fluids with examples. (05 Marks)  
b. Derive Barometric equation. (06 Marks)  
c. With a neat sketch, explain Reynolds experiment. (05 Marks)

OR

- 2 a. The right limb of V – tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The centre of pipe is 12cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe, if the difference of mercury level in the two limit is 20cm. (06 Marks)  
b. Define Free settling, Hindered settling, Drag sedimentation. (06 Marks)  
c. Explain the significance of Hagen – Poiseulle equation. (04 Marks)

### Module-2

- 3 a. With a neat sketch, explain working and characteristics of centrifugal pump. (06 Marks)  
b. State and explain different law's of size reduction. (04 Marks)  
c. Write a note on the following :  
i) Power number ii) Differential analysis iii) Cumulative analysis. (06 Marks)

OR

- 4 a. Explain the construction and working of Rotary drum filtration. (06 Marks)  
b. Describe the working of ball mill. (06 Marks)  
c. Define Mixing and Agitation. Describe the various types of impellers. (04 Marks)

### Module-3

- 5 a. Derive an expression for heat flux for heat loss through composite furnace wall (flat surface) with three layers in series by conduction. (08 Marks)  
b. A steel pipe of 115mm outside diameter and a wall thickness of 5mm is covered with 50mm thick magnesia insulation. Inside temperature is 150°C and that of outside surface temperature is 32°C. Determine i) that loss per meter length of pipe (Q/A)  
ii) Temperature at the surface between steel pipe and insulation  
Data :  $K_{\text{pipe}} = 43.03 \text{ W/m.k}$  ;  $K_{\text{magnesia}} = 0.07 \text{ W/m.k}$ . (08 Marks)

OR

- 6 a. Write a note on the following : i) Fouling factor ii) Heat transfer coefficient  
iii) Critical thickness of insulation. (06 Marks)  
b. Derive an expression for Log Mean Temperature Difference (LMTD). (06 Marks)  
c. Briefly explain the different modes of heat transfer. (04 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.

**Module-4**

- 7 a. Describe the construction and working of a 1 – 2 shell and tube heat exchanger, with a neat sketch. (10 Marks)
- b. Derive an expression for diffusivity of a component through a stagnant fluid from Fick's law of diffusion. (06 Marks)

**OR**

- 8 a. Explain the experimental method used for measurement of diffusivity. (07 Marks)
- b. Briefly explain the following :
- Interphase mass transfer.
  - Mass, heat and momentum transfer analogies.
  - Equilibrium. (09 Marks)

**Module-5**

- 9 a. Explain with a neat sketch, the working of simple distillation. (06 Marks)
- b. A liquid mixture has a relative volatility of 2.5. Compute the VLE data for the liquid mixture. The above mentioned liquid mixture is to be fed to the distillation column for separation. Feed is a liquid at its bubble point with 50 mol % more volatile component. The product contains 95mol % more volatile component and residue contains 10 mol % MVC. Reflux ratio R is 2.5. Calculate number of theoretical plates required and also the position of feed plate. (10 Marks)

**OR**

- 10 a. Explain Drying operation and draw a drying rate curve. (06 Marks)
- b. Define Liquid – liquid extraction and state briefly the field of application of extraction. (04 Marks)
- c. With a neat sketch, explain the working of Tray Dryer. (06 Marks)

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