CBCS Scheme

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15BT32

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Unit Operations

Time: 3 hrs. Max. Marks: 80

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

Module-1

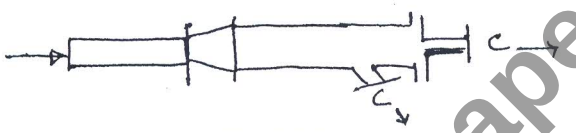
1 a. Define Fluid. Give the Rheological classifications with examples. **(06 Marks)**

b. Derive Bernoulli's equation stating all the assumption made. **(10 Marks)**

OR

2 a. Explain with neat sketch Reynold's experiment and its significance. **(06 Marks)**

b. Water (density 1000 kg/m^3) flows through the piping system as show in Fig Q2(b). A equal quantity of water flows through each of the pipes 'C'. The flow through pipe A is 10m^3/h. Calculate : i) Mass flow rate in each ii) Average velocity in each pipe. **(10 Marks)**



Pipe A : d_A = 500mm ϕ
Pipe B : d_B = 75mm ϕ
Pipe C : d_C = 40mm ϕ

Fig Q2(b)

Module-2

3 a. Derive with a neat sketch an expression for discharge through orifice meter. **(10 Marks)**

b. Compare centrifugal pump with reciprocating pump **(06 Marks)**

OR

4 a. With a neat sketch explain principle, construction, working of conical ball mill. Centrifuging is not preferred in ball mill. Justify. **(10 Marks)**

b. Find out the critical speed of the ball mill by using following data :
Diameter of ball mill = 450mm
Diameter of ball = 25mm **(06 Marks)**

Module-3

5 a. Explain three modes of heat transfer with example. **(04 Marks)**

b. A furnace wall is made up of 230mm fire brick, 75mm insulating brick and 89mm of Red brick. The temperature at the inner surface of the wall 1073K and that of the outer surface is 333K. Average thermal conductivity values of the three types of bricks i.e., fire brick, insulating brick and red brick are 1.21, 0.121 and 0.865 W/mk respectively. Calculate the temperature at the interface between fire brick/insulating brick and insulating brick/red brick. Comment on your result **(12 Marks)**

OR

6 a. Differentiate between film wise and drop wise condensation. **(04 Marks)**

b. Explain Fourier's law of heat conduction. Derive an expression for steady state conduction through multilayer walls. **(08 Marks)**

c. What is Log Mean Temperature difference? Mention its significance. **(04 Marks)**

Module-4

7 a. A heat exchanger is required to cool 20kg/s of water from 360K to 340K by means of 25kg/s of water entering at 300K. Specific heat of water = 4.187kJ/kg K. If the overall heat transfers co-efficient is 2000W/m^2.K. Calculate the surface area required in,

i) Co-current concentric tube exchanger

ii) Counter current concentric tube exchanger. **(08 Marks)**

b. What is Fick's law of Diffusion? Derive an expression for steady state molecular diffusion in gases (counter – current equimolar) condition. **(08 Marks)**

OR

8 a. Explain the a neat sketch construction of shell and tube heat exchanger. **(08 Marks)**

b. Derive an expression for the mass transfer of component A in to stagnant layer of component B. **(08 Marks)**

Module-5

9 a. Explain the process involved in separating two components by distillation. Discuss McCabe Thiele method. **(10 Marks)**

b. Write a note on selection of solvents for extraction operation. **(06 Marks)**

OR

10 Write short notes on the following processes :

a. Drying

b. Extraction

c. Methods of distillation

d. Mass transfer operations **(16 Marks)**

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