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C20-CHPC-305

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BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER/NOVEMBER—2023

DCHPC - THIRD SEMESTER EXAMINATION

UNIT OPERATIONS—I

Time : 3 Hours] [*Total Marks* : 80

PART—A 3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. Write the equation of continuity.

2. Write the classification of fluids.

3. Write the relation between friction factor and Reynolds number in laminar flow and turbulent flow.

4. Write the effect of roughness on friction factor.

5. List three types of flow meters.

6. Explain the equation for heat conduction through a single plane wall.

7. Draw the diagram of counter current and parallel current flows in a heat exchanger.

8. Write the empirical equations of Dittus-Boelter equation and Sieder tate equation.

9. Define the terms absorptivity and reflectivity.

10. List the accessories of an evaporator.

PART—B

8×5=40

Instructions : (1) Answer **all** questions.

(2) Each question carries **eight** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. Water of density 1000 kg/m^3 and viscosity 0.0008 $(N.S)/m^2$ is pumped at a rate of 1000 cm^3/s through a 25 mm i.d. pipe. Calculate the Reynolds number.

(OR)

A U-tube manometer is used to measure pressure drop across an orifice meter. The manometric fluid is mercury (sp. gr. = 13.6) and the fluid flowing through the pipeline is brine (sp. gr. = 1.26). When the pressure at taps are equal, the level of mercury in the manometer is one meter below the taps. In operating conditions, the pressure at the upstream tap is 115.324 kN/m^2 absolute and that at the downstream tap is 33.86 kN/m^2 below the atmospheric pressure. What is the reading of manometer in centimeters?

12. Explain fluidization and write its applications.

(OR)

Derive an equation $u/u_{max} = 0.5$ for a laminar flow through a circular pipe.

13. A furnace wall is made up of 230 mm of fire brick, 75 mm of insulating brick and 89 mm of red brick. The temperature at the inner surface of the wall is 1073 K (800 °C) and that of the outer surface is 333 K (60 °C). Average thermal conductivity values of the three types of bricks, i.e., fire brick, insulating brick and the red brick are 1.21, 0.121 and 0.865 W/(m.K), respectively. Calculate the temperature at the interface between different kinds of bricks.

(OR)

An ice box has walls constructed of a 10 mm layer of cork-board contained between two wooden walls, each of 20 mm thick. Find the rate of heat removed per unit area if the inner wall surface is kept at 263 K(–10 °C), while the outer surface temperature is 303 K (30 °C). Find out the zone in the wall where the temperature is 293 K (20 °C). Data : Thermal conductivity of cork-board and wood respectively are 0.041 and 0.105 W/(m.K).

14. Write about natural and forced convection heat transfer.

(OR)

Derive the overall heat transfer coefficient from individual heat transfer coefficient.

15. Explain the principle, construction and working of multipass heat exchanger with different temperature patterns.

(OR)

Explain the methods of feeding, advantages and disadvantages of the multiple effect evaporator system.

PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) The question carries **ten** marks.

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. Explain the reason why the discharge coefficient of venturimeter is more than that of an orifice meter.

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