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C09-CH-405/C09-PET-405

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BOARD DIPLOMA EXAMINATION, (C-09)  
MARCH/APRIL—2017  
DCHE—FOURTH SEMESTER EXAMINATION

HEAT TRANSFER

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 about Fourier's law of heat conduction.
2. Why do we use number of insulations in series in furnaces?
3. Describe heat flux.
4. Write a short note on film coefficients.
5. Define Graetz number.
6. Define absorptivity, reflectivity and transmittivity.

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7. Explain combined heat transfer by conduction, convection and radiation.
8. Draw the neat diagram of 1-2 shell and tube heat exchanger.
9. Write material balance for single-effect evaporator.
10. Explain the parallel feed operation in the multiple-effect evaporator with a neat sketch.

**PART—B**

10×5=50

**Instructions :** (1) Answer *any five* questions.

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

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

11. A furnace wall is made up of 230 mm of fire brick, 75 mm of insulating brick, 39 mm of red brick. The temperature at the inner surface of the wall is 1073 K and that of the outer surface is 60 °C. Average thermal conductivity values of three types of bricks—fire brick, insulating brick and red brick are 1.21 W/m K, 0.121 W/m K and 0.865 W/m K respectively. Calculate the temperatures at the interface between different kinds of bricks.

12. (a) Write about fouling factor.

(b) Cold fluid is flowing through double-pipe heat exchanger at a rate of 15 m<sup>3</sup>/hr. It enters at 30 °C and is to be heated to 65 °C. Hot fluid is available at the rate of 20 m<sup>3</sup>/hr and at 120 °C. Find out the LMTD for counter current and cocurrent flow.

Data :

Specific heat of hot fluid = 2.82 kJ/kg K

Specific heat of cold fluid = 4.187 kJ/kg K