PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Max Marks: 30 | Max Time: 55 Mins | Weightage: 15 % | **Set A**

TEST 3

II Semester 2016-2017 | Course: **PE A 204 Heat Transfer** | 18 April 2017

Instructions:

i. Write legibly
ii. HMT Data Book is permitted
iii. Scientific and non-programmable calculators are permitted

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Part A

(3 Q x 3 M = 09 Marks)

1. Define effectiveness. Explain its significance.
2. What advantage does effectiveness NTU method have over the LMTD method?
3. Write short notes on classification of heat exchanger.

Part B

(2 Q x 6 M = 12 Marks)

4. A counter flow double-pipe heat exchanger is to be used to heat 0.7 kg/s of water from 35 to 90°C with an oil flow of 0.95 kg/s. The oil has a specific heat of 2.1kJ/kg. °C and enters the heat exchanger at a temperature of 175°C. The overall heat-transfer coefficient is 425 W/m^2. °C. Calculate the area of the heat exchanger.
5. A one shell pass and one tube pass heat exchanger uses hot water to heat air from 20 to 45°C. The entering water temperature is 75°C and its exit temperature is 45°C. The total heat-transfer rate is to be 35 kW. If the overall heat transfer coefficient is 50 W/m^2.°C, Calculate the area of the heat exchanger.

Part C

(1 Q x 09 M = 09 Marks)

6. In a large air-conditioning application, 1500 m^3/min of air at 1 atm and 10°C are to be heated in a finned-tube cross flow heat exchanger with hot water entering the exchanger at 80°C. The overall heat-transfer coefficient is 50 W/m^2.°C. Calculate the required area for the heat exchanger for an exit air temperature of 37°C and exit water temperature of 48°C.

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Max Marks: 30 | Max Time: 55 Mins | Weightage: 15 % | **Set A**

TEST 2

II Semester 2016-2017 | Course: **PE A 204 Heat Transfer** | 22 March 2017

Instructions:

i. Write legibly
ii. HMT Data Book is permitted
iii. Scientific and non-programmable calculators are permitted

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Part A

(3 Q x 3 M = 09 Marks)

1. Explain briefly " lumped heat capacity system analysis"
2. Define Biot Number & Fourier Number? What is the condition required to apply Heisler Charts?
3. What is conduction shape factor? Explain its significance.

Part B

(2 Q x 6 M = 12 Marks)

4. Two pipes are buried in the earth and maintained at temperatures of 200^0C and 100°C. The diameters are 9 cm and 18 cm, and the distance between centers is 40 cm. Calculate the heat-transfer rate per unit length if the thermal conductivity of earth at this location is 1.1 W/m·°C.
5. A copper sphere having a diameter of 3 cm is initially at a uniform temperature of 50°C. It is suddenly exposed to an airstream of 10°C with h=15 W/m^2°C. Check whether lumped capacity method can be applied or not. If yes, then calculate the time required for sphere temperature to drop to 25°C.

Part C

(1 Q x 09 M = 09 Marks)

6. A infinite plate of Chromium-Nickel Steel (18% Cr, 8% Ni) has a thickness of 3.0 cm and is initially uniform in temperature at 500°C. The plate is suddenly exposed to a convection environment on both sides at 40°C with h=150 W/m^2.°C. Calculate the time for the centre temperatures to reach 120°C.

PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Max Marks: 30 | Max Time: 55 Mins | Weightage: 15 % | **Set A**

TEST 1

II Semester 2016-2017 | Course: **PE A 204 Heat Transfer** | 21 February 2017

Instructions:

i. Write legibly
ii. Heat & Mass Transfer data book is permitted
iii. Scientific and non-programmable calculators are permitted

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Part A

(3 Q x 3 M = 09 Marks)

1. Define thermal conductivity and Explain its significance
2. What is meant by thermal contact resistance? Upon what parameters these resistances depend?
3. Define i) Fin efficiency ii) Fin effectiveness

Part B

(2 Q x 6 M = 12 Marks)

4. A 50-cm-diameter pipeline in the Arctic carries hot oil at 30°C and is exposed to a surrounding temperature of −20°C. A special powder insulation 5 cm thick surrounds the pipe and has a thermal conductivity of 7 mW/m °C. The convection heat-transfer Coefficient on the outside of the pipe is 9 W/m^2 °C. Estimate the energy loss from the pipe per meter of length.

5. A composite wall is formed of a 2.5 cm copper plate, a 3.2-mm layer of asbestos, and a 5-cm layer of fiberglass. The wall is subjected to an overall temperature difference of 560°C. Calculate the heat flow per unit area through the composite structure.

Part C

(1 Q x 09 M = 09 Marks)

6. A straight fin of rectangular profile is constructed of stainless steel (18% Cr, 8% Ni) and has a length of 5 cm and a thickness of 2.5 cm. The base temperature is maintained at 100°C and the fin is exposed to a convection environment at 20°C with $h = 47$ W/m^2 °C. Calculate the heat lost by the fin per meter of depth, and the fin efficiency.