Ministry of Higher Education
& Scientific Research
Tikrit University
College of Engineering
Mechanical Engineering Dept.

جامعة تكريت

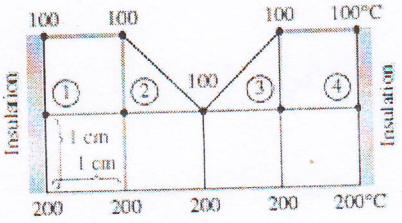
Final Exam
2015-2016

Class : Third
Subject: Heat Transfer
Time: 3 hrs.
Date : 26 / 5 / 2016
Form: (A)

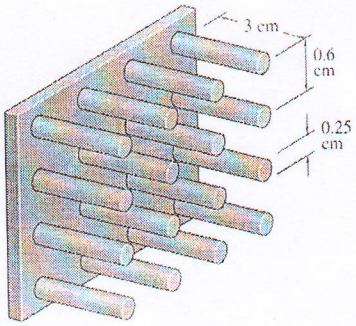
Q1. A certain semiconductor material has a conductivity of 0.0124 W/cm.°C. A rectangular bar of the material has a cross-sectional area of 1 cm^2 and a length of 3 cm. One end is maintained at 300°C and the other end at 100°C, and the bar carries a current of 50A. Assuming the longitudinal surface is insulated, calculate the midpoint temperature in the bar. Take the resistivity as $1.5*10^{-3}$ Ω.cm.

Q2. Hot exhaust gases leaving a stationary diesel engine at 450°C enter a 15-cm diameter pipe at an average velocity of 3.6 m/s. The surface temperature of the pipe is 180°C. Determine the pipe length if the exhaust gases are to leave the pipe at 250°C after transferring heat to water in a heat recovery unit. Use properties of air for exhaust gases.

Q3. Consider steady two-dimensional heat transfer in a long solid bar whose cross section is given in the figure. The measured temperatures at selected points on the outer surfaces are as shown. The thermal conductivity of the body is k= 20 W/m.°C, with a heat generated uniformly at a rate of 10^6 W/m^3. Using the finite difference method with a mesh size of $\Delta x=\Delta y$=1.0 cm, determine the temperatures at the indicated points in the medium.



Q4. A hot surface at 100°C is to be cooled by attaching 3-cm-long, 0.25-cm-diameter aluminum pin fins (k = 237 W/m.°C) to it, with a center-to-center distance of 0.6 cm. The temperature of the surrounding medium is 30°C, and the heat transfer coefficient on the surfaces is 35 $W/m^2.°C$.
Determine the rate of heat transfer from the surface for a 1-m* 1-m section of the plate. Also determine the overall effectiveness of the fins.



جامعة تكريت - كلية الهندسة
قسم الهندسة الميكانيكية
- - أيار ٢٠١٦
اللجنة الامتحانية

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