

Name: _____.

Mini-Exam III

CM 3110

12 November 2007

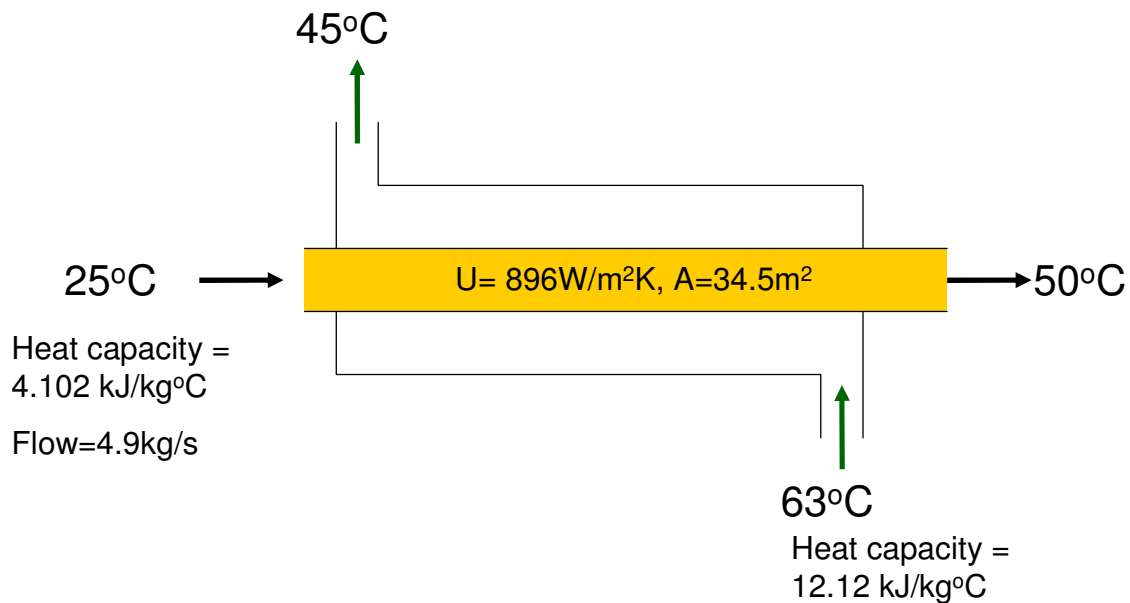
Note:

Significant figures count.

Please box your final answers.

Please be neat.

1. (50 points) For the double-pipe heat exchanger shown below with overall heat transfer coefficient $896 \text{ W/m}^2\text{K}$ and heat transfer area of 34.5 m^2 , what is the total rate of heat transfer? Please give your answer in kW.



2. (50 points) A steel pipe (thermal conductivity = $26.0 \text{ BTU/h ft } ^\circ\text{F}$, density = $487.5 \text{ lb}_m/\text{ft}^3$, inner diameter 2.00 in, outer diameter 2.50 in) is insulated with asbestos (thermal conductivity = $0.100 \text{ BTU/h ft } ^\circ\text{F}$, density = $20.4 \text{ lb}_m/\text{ft}^3$) of thickness 1.00 in. The pipe carries boiling water at 212.00°F , and the temperature of the inside surface of the pipe is 212.00°F . The outside of the steel pipe is measured very accurately to be 211.82°F . What is the temperature at the outer surface of the asbestos insulation?