<u>Submitted by: Nancy Morsy Ismail Aly Saleh</u>

<u>Week 1 submission</u>

Summary about the conductive heat transfer:

The transfer of heat to the wall is one dimensional where the temperature of the wall depends on one direction only (ex: T(x))

The transfer of heat to the wall maybe steady where the rate of heat transfer through the wall is constant and distributed in a straight line.

Q in – Q out = dEwall / dt = 0

The rate of change of energy of the wall is the difference between the rate of heat transferred into the wall and the rate of heat transferred out of the wall

From Fourier's law of heat conduction it's proven that Q cond.wall = -kA dT/dx, where Q is the rate of energy conducted by wall equals the conductivity constant of the wall multiplied by the area of the wall surface and the ratio of thermal change (Heat transferred in – Heat transferred out) to the wall thickness. Therefore, the Rate of heat energy conducted is directly proportional to the wall area and the temperature change and inversely proportional the wall thickness.

In the thermal resistance concept, the thermal resistance of a medium depends on it's geometry and thermal properties, which proves the equation R wall = L / kA which is the ratio of the length of the medium to the conductivity and area of the medium. By this equation we can get the rate of energy conducted by wall by the equation Q cond.wall = (T1-T2) / Rwall where the ratio of the thermal change to the conduction resistance of the wall.

The heat flow [Q= (T1-T2)/R] is the rate of heat transfer is a ratio of the temperature difference to the thermal resistance. While the electric current flow [I= (V1-V2)/Re] is the ratio of the voltage difference to the electric resistance.

Example 1:

Given:

L= 0.4m A= 20m2 DeltaT= 25 K= 0.78 W/mK

Answer:

<u>Simple method:</u>

Q . = kA dt/dx Q . = (0.78) (20) (25/0.4) = 975 W

<u>Resistance concept:</u>

R= L/kA , R= 0.4 / (0.78 x 20) , R= 0.0256(C/W), Q . = DeltaT / Rwall, Q . = 25/ 0.0256 = 975 W