# Chapter 1

1. **A Copper bar with a diameter of 1.2cm and length 20cm is insulated with micanite which fits tightly around the bar and into the rotor slot of induction motor. Thickness of the micanite tube is 1.5mm and thermal resistivity is . Calculate the loss that will pass from copper bar to iron for a temperature difference of C maintained between them.**

**Solution:**

Diameter of Copper Bar, D = 12mm = 12\*m

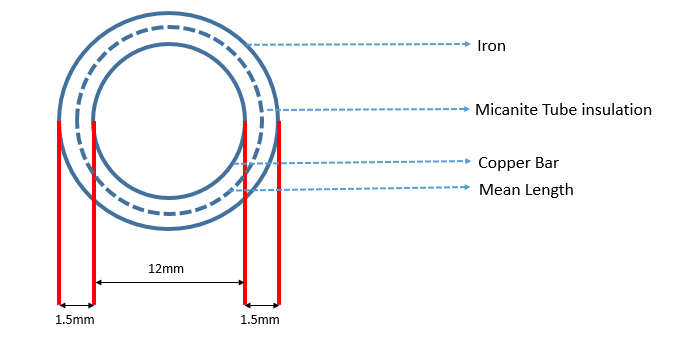
Thickness of Micanite Tube, t = 1.5mm = 1.5\*m

Thermal Resistivity () =

Temperature difference, () = C

Length of Copper bar, L = 0.2m

Loss that will pass from copper bar to iron, = ()/



Thermal Resistance, =   
Surface area of insulation s = π\*(D + t)\*L = π\*(12+1.5)\*\*0.2 = 8.4823\*

=  = 11.4147

= = 17.6715 W

1. **A 230V, 2.5KW single element resistor is made of a cylindrical nichrome wire. The temperature rise of strip should not exceed C over the ambient temperature of C Determine the length and diameter of strip assuming coefficient of emissivity() 0.9, radiating efficiency = 1 and resistivity of nichrome wire() as 0.424 .**

**Solution:**

Voltage = 230V; Power() = 2.5KW

Temperature of nichrome wire, = 1200 + 20 = C (Converted to absolute temperature as 1493K)

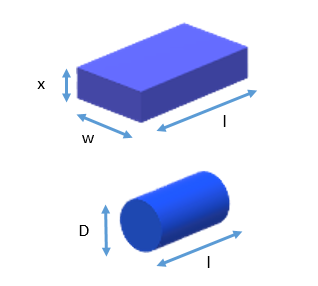
Temperature of Ambient medium, = C (Converted to absolute temperature as 293K)

Coefficient of emissivity () = 0.9

Radiating Efficiency () = 1

Stefan's Boltzmann constant,

Heat dissipated from material,



Resistance of nichrome wire, R = ()

R = 21.16

R = ()/A

A = (

------------------------------------------------------------------------------------------------- (1)

Total heat radiated,

= 3.1266\* ----------------------------------------------------------------------------------------- (2)

Solve eq. (1) and eq. (2),

D = 0.0726m;L = 0.0430m