A stainless steel rod of length 2-m and cross-sectional area 40-m^2 has a temperature of 25° C at one end and a temperature of 20° C at the other end. What is the rate of heat conduction along the steel rod?

Given:

Length of the steel rod: $L = 2$ m

Area of cross-section of steel rod: $A = 40\ m^2$

Temperature at one end of the rod: $T_1 = 25°\ C$

Temperature at other end of the rod: $T_2 = 20°\ C$

Determine: Rate of heat conduction along the steel rod: $Q / \Delta t$

Q = amount of heat energy transferred along the rod

Δt = time taken to transfer Q along the rod

Use formula:

$$Q / \Delta t = (kA / L)\ \Delta T \text{ ----------(1)}$$

"k" is the thermal conductivity of the material and has the value 14 W/m.°C for stainless steel.

ΔT is the temperature difference between the two ends of the rod: $(T_1 - T_2)$

Substituting for k, A, L and ΔT in (1):

$$\mathbf{Q / \Delta t = (14 \times 40 / 2) \times 5 = 1400\ Watts}$$