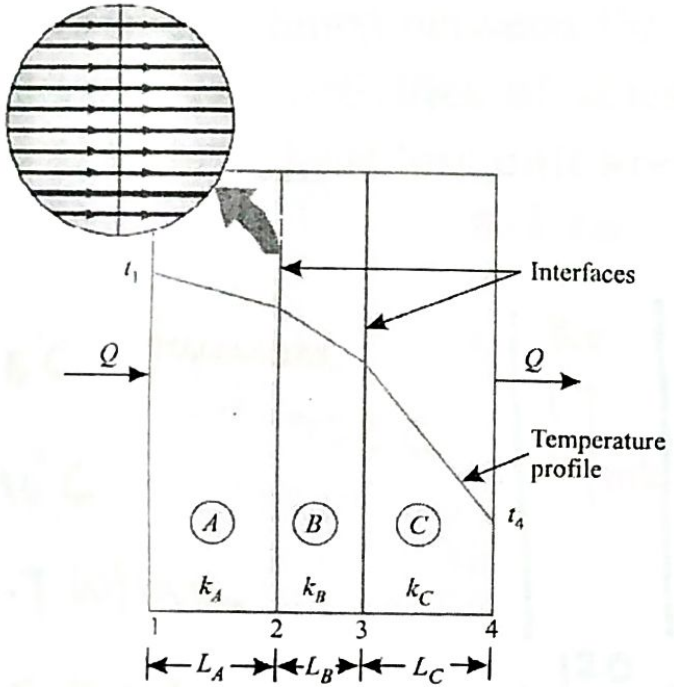
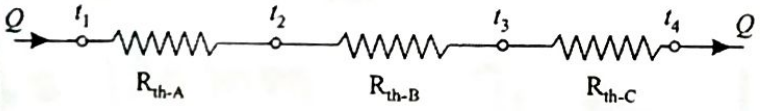
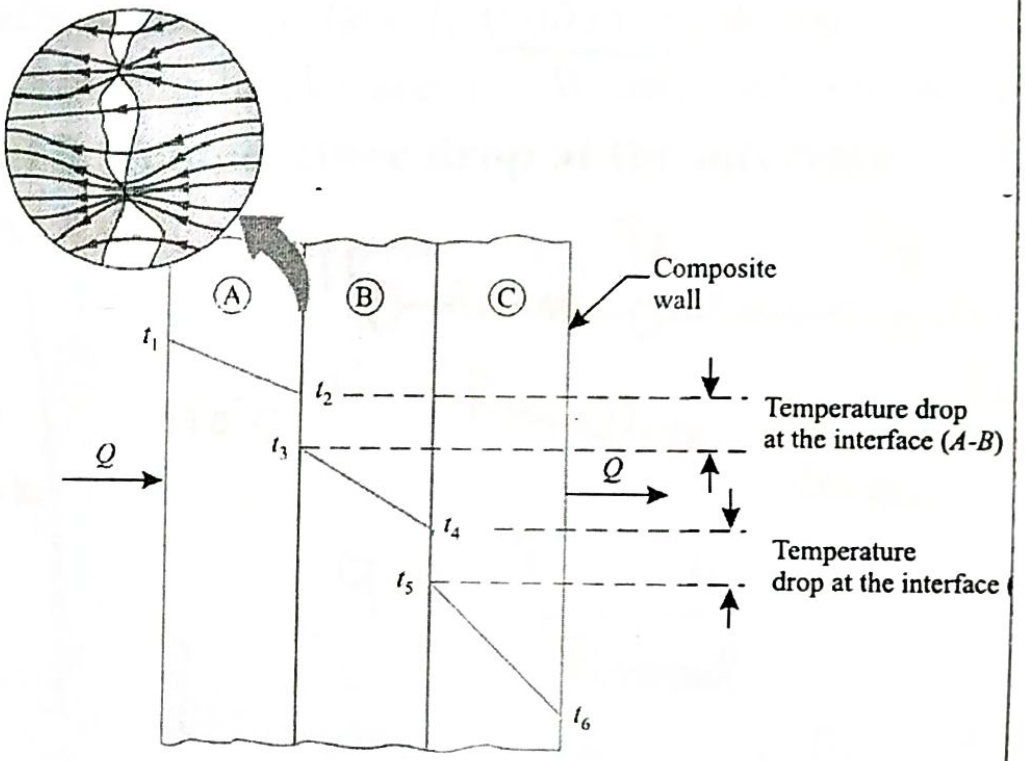
Thermal Contact Resistance





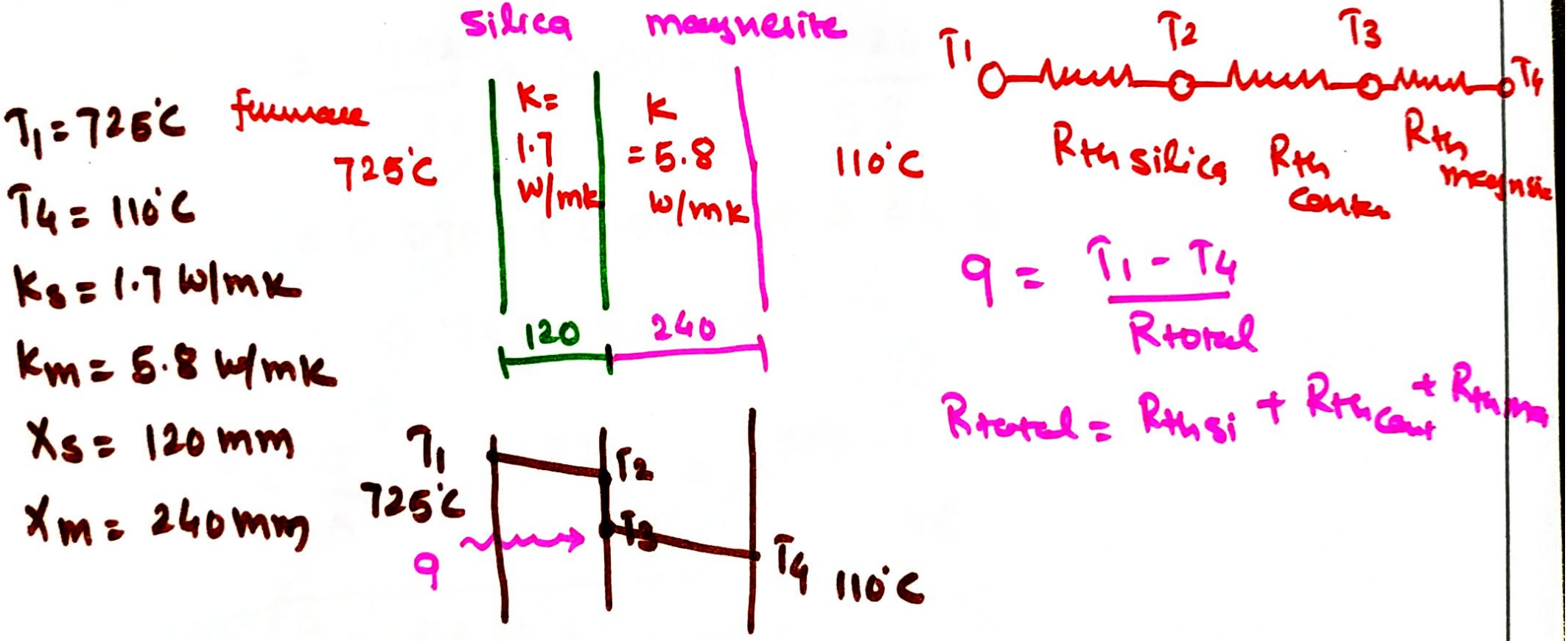
1) Perfect contact between Two adjacent layer

2) No Temp. fall at interface



$$(R_{th-AB})_{\text{cont.}} = \frac{(t_2 - t_3)}{Q/A} \quad \text{and} \quad (R_{th-BC})_{\text{cont.}} = \frac{(t_4 - t_5)}{Q/A}$$

Q. A wall of a furnace is made up of inside layer of silica brick 120 mm thick covered with a layer of magnesite brick 240 mm thick. The temperature at the inside surface of silica brick wall and outside surface of magnesite brick wall are 725 °C and 110 °C respectively. The contact thermal resistance between the two walls at the interface is 0.0035 °C/W per unit wall area. If thermal conductivities of silica and magnesite bricks are 1.7 W/mK and 5.8 W/mK, **Calculate 1. Rate of heat loss unit area of wall 2. Temperature drop at the interface**



$$R_{total} = R_{th\,silica} + R_{th\,concrete} + R_{th\,magnesite}$$

$$= \frac{X_s}{A_s K_s} + 0.0035 + \frac{X_m}{A_m K_m}$$

$$= \frac{0.12}{1.7} + 0.0035 + \frac{0.24}{5.8}$$

$$= 0.070 + 0.0035 + 0.0413$$

$$= 0.1148 \ ^\circ C/w m^2$$

$$q = \frac{\varphi}{A} = \frac{\Delta T}{R_{total}} = \frac{725 - 110}{0.1148}$$

$$\boxed{q = 5324.67 \ w/m^2}$$

$$q = \frac{T_1 - T_2}{\frac{x_s}{k_s}}$$

$$5324.67 = \frac{750 - T_2}{\frac{0.12}{1.7}}$$

$$T_2 = 349.14^{\circ}C$$

$$q = \frac{T_3 - T_4}{\frac{x_m}{k_m}}$$

$$5324.67 = \frac{T_3 - 110^{\circ}C}{\frac{0.24}{5.8}}$$

$$T_3 = 330.33^{\circ}C$$

$$T_2 - T_3 = 18.85^{\circ}C$$