**Comfortable and Healthy Indoor Climate EEN-E4001**

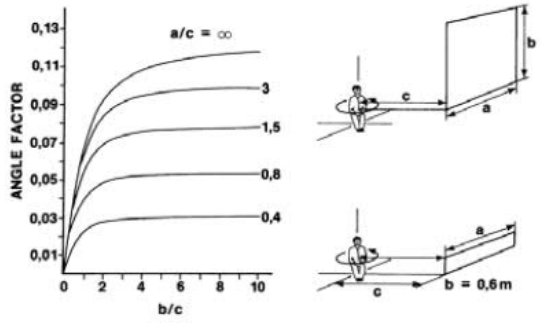
**Exercise 3 for Lecture 3/2019**

Return date 30.1.2019

**1. Local thermal dissatisfaction:**

A) U-value of window is 1.4 W/m²K and internal heat transfer coefficient of window surface $\alpha_s$ is 7.0 W/Km². Indoor air temperature is +22.5°C and outdoor air temperature is –30°C. ***Calculate the temperature of indoor surface of window.***

B) Workplace of sitting person is located in the middle of window. The distance of workplace is 1.2 m:n from window. The width of window is 3. m and the height of window is 2.4 m. The underedge of window is at floor level. **Define using the given graphs the view factor of window.**




C) All other surfaces except window are at +20°C. **Calculate the average radiant temperature of surfaces using the calculate surface temperature of window (A) and view factor (B)**

2. Calculate the previous set room's

A) operative temperature

B) radiant asymmetry of external window wall and internal wall and define is the radiant asymmetry acceptable ?

**3. The whole body thermal sensation:**

The target level of PMV is set to be 0.35. By using the giving tool, analyse how the thermal sensation could be improved from the starting point show in the following Figure. Explain and justify how the physical parameters and also clo-value should be changed to reach the set target value by changing physical parameters in summer conditions.

## 4. Local thermal dissatisfaction:

By using the following draught rate equation, analyse the effect of the room air temperature on draught rating (DR) when is changed from 23 °C to 26 °C when the average air velocity and turbulence intensity are

a) 0.15 m/s @ Tu=60 % and

b) 0.28 m/s @ Tu = 40 %.

$$DR = (34 - t_a)(\bar{v} - 0{,}05)^{0{,}62}(0{,}37 * \bar{v} * Tu + 3{,}14)$$

$\bar{v}$ = average velocity (m/s)

Tu = turbulence intensity (%)

$T_a$ = room air temperature (°C)