# **7LY3M0 – online workbook – answer sheet**

# Thermal comfort

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| 1a. What range of values for relative air velocity \_var yield a comfortable PMV? Note: with  “comfortable”, we mean PMV values between -0.5 and 0.5. |
| for ta = 25 degrees C:  \_var = 0.1463 m/s yields \_pmv = 0.5000.  The PMV does not go below -0.45 for any value of \_var. Therefore  -0.5 < PMV < 0.5 for \_var>0.1463m/s |

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| 1b. What range of values for relative air velocity \_var yield a comfortable PMV? |
| for ta = 30 degrees:  The PMV does not go below 1.12 for any value of \_var. This is the least uncomfortable PMV achievable at this temperature. |

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| 1c. For ta = 30 degC, name two strategies that could be used to improve thermal comfort. Support your arguments with literature and refer back to the PMV calculation. |
| The first step for improving thermal comfort when occupants are too hot should be adjustment of their clothing. The file initially uses 1 clo as a starting point, while normal summer clothing are around 0.6 clo and should improve the thermal comfort of occupants quite drastically.(Howell&Kennedy, 1979) Implementing this change causes the PMV to converge to 0.54 for very high \_var. At a \_var of 3 m/s, a pretty strong breeze for indoors, PMV = 0.65. This is already a massive improvement compared to PMV = 1.29 at the same \_var but with clo=1.0.  Another effective measure would be increasing thermal reflectivity of the windows. (Goia et al., 2013) Changing this from the given 23 degrees to 20.7 gives PMV = 0.5 at clo = 0.6.  Combining the proposed measures gives the desired result. |

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| 2a. How does your data compare to the example? Include screenshots in your answer. |
| Figure Weather Station 210    Figure Weather Station 260 |

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| 2b. What do you notice when you compare the warmest day and the average day? Explain why this happens. |
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| 3a. Discuss the difference between the heat balance method and the adaptive method. Mention a hypothetical scenario where the heat balance approach would be more suitable or vice versa. |
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| 3b. List two variables that influence thermal comfort but aren’t included in the two models. Make sure to support your statements via literature. |
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Sources:

Howell, W. C., & Kennedy, P. A. (1979). Field Validation of the Fanger Thermal Comfort Model. Human Factors: The Journal of the Human Factors and Ergonomics Society, 21(2), 229–239. https://doi.org/10.1177/001872087902100211

Goia, F., Perino, M., & Serra, V. (2013). Improving thermal comfort conditions by means of PCM glazing systems. Energy and Buildings, 60, 442–452. https://doi.org/10.1016/j.enbuild.2013.01.029