



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER 1  
SESSION 2018/2019**

COURSE NAME : THERMAL ENVIRONMENTAL DESIGN  
COURSE CODE : BDE 40903  
PROGRAMME : BDD  
EXAMINATION DATE : DECEMBER 2018/ JANUARY 2019  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER FIVE (5) QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **THREE (3)** PAGES

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- Q1** (a) Assemble the relationship between Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied (PPD) in thermal comfort studies. (8 marks)
- (b) Differentiate these four main local discomfort
- (i) Draught;
  - (ii) asymmetry of thermal radiation;
  - (iii) vertical air temperature difference; and
  - (iv) floor temperature
- (12 marks)
- Q2** (a) Differentiate these three categories of adaptive thermal comfort with proper elaboration and examples
- (i) Physiological adaptation;
  - (ii) behavioral adaptation; and
  - (iii) psychological adaptation.
- (12 marks)
- (b) The Predicted Mean Vote (PMV) model of thermal comfort created by Fanger in the late 1960s is used worldwide to assess thermal comfort.
- (i) Describe briefly about PMV model; and
  - (ii) criticize the PMV model based on the environmental engineering practice requirement for a predictive method that is applicable to all types of people in any kind of building in every climate zone.
- (8 marks)
- Q3** (a) Describe and give examples for heat acclimatization process. (8 marks)
- (b) You had been hired as the heat stress assessor for a biscuit factory in Perak. Most of the workers of the company were foreign workers and worked in the factory daily from 8.00 a.m until 7.00 p.m. The factory management, received an employee complaint regarding heat stress in the baking section. The complaint alleged that employees were working in hot temperature cause by the radiant heat of the industrial oven during baking process. They felt dehydrated, the temperature may have affected an employee's breathing, an employee was sent to the emergency room for heat exhaustion, and the conditions were unworkable. As the heat stress assessor; propose heat stress investigation that will be carried out to the company with appropriate elaboration. (12 marks)

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- Q4** (a) Health effects due to poor Indoor Air Quality (IAQ) include sick building syndrome (SBS) and building related illness (BRI). Distinguish the difference between SBS and BRI. (10 marks)
- (b) Assemble the ventilation design hierarchy for natural, mechanical and hybrid ventilation (10 marks)
- Q5** (a) You had been hired as a thermal comfort assessor for a law firm in Selangor. Most of the workers of the company worked in sedentary mode with general office work in air conditioned environment. However, some of the workers often complain of discomfort and feeling too cold during morning from 9.00 to 11.00 a.m. As the thermal comfort assessor; propose thermal comfort investigation and assessment that you will conduct. (12 marks)
- (b) Discuss the determination of the acceptable thermal conditions in occupant-controlled naturally conditioned spaces. (8 marks)
- Q6** (a) You have been hired as an indoor air quality assessor for an automotive service centre in Johor Bahru. The workers of the automotive service centre works in a semi air-conditioned environment. However, the office workers often complain of dizziness, headache, nausea and eye irritations. As the indoor quality assessor, construct a flowchart for indoor air quality investigation and assessment that you will conduct. (10 marks)
- (b) Propose several solutions on improving the indoor air quality in the workplace based on the possible indoor pollutants exists in the workplace. (10 marks)

- END OF QUESTION -

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