

**CONFIDENTIAL**



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2014/2015**

COURSE NAME : INDOOR AIR QUALITY  
COURSE CODE : BNB 40103  
PROGRAMME : 3 BNB  
EXAMINATION DATE : JUNE 2015 / JULY 2015  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTIONS PAPER CONSISTS OF **FOUR (4)** PAGES

**CONFIDENTIAL**

- Q1**
- (a) Define thermal comfort by ASHRAE Standard 55-1992[2] and ISO 7730[10].  
(2 marks)
- (b) Explain how heat gain and heat loss in human body.  
(4 marks)
- (c) Name and sketch the equipment used to measure parameters below:  
(i) Dry bulb and wet bulb temperature  
(ii) Relative humidity  
(iii) Air velocity  
(iv) Mean radiant temperature  
(4 marks)
- (d) Categories and discuss **THREE (3)** main factors influencing thermal comfort.  
(15 marks)
- Q2**
- (a) Differentiate between Indoor Environmental Quality (IEQ) and Indoor Air Quality (IAQ).  
(6 marks)
- (b) State **SIX (6)** factors that influencing IAQ.  
(6 marks)
- (c) From Industry Code of Practice on Indoor Air Quality 2010, identify the standard limit/range for the parameters below:  
(i) Relative Humidity  
(ii) Temperature  
(iii) Carbon monoxide  
(iv) Carbon dioxide  
(v) Formaldehyde  
(vi) Total Volatile Organic Compound (TVOC)  
(3 marks)
- (d) Explain how the IAQ can effects on human respiratory tract.  
(4 marks)
- (e) In your opinion, why IEQ is important for building occupants? Relate your answer with Sick Building Syndrome (SBS) and Building Related Illness (BRI).  
(6 marks)

- Q3**
- (a) Define **THREE (3)** common categories of indoor air pollutant (IAP) and give **TWO (2)** examples for each categories. (6 marks)
  - (b) Briefly describe Volatile Organic Compound (VOC). (4 marks)
  - (c) Formaldehyde is one of the main causes in IAP. The chemical formula for formaldehyde is CH<sub>2</sub>O and the molecular weight is 30.03 g/mol. Examine below:
    - (i) What is formaldehyde? (3 marks)
    - (ii) The causes of formaldehyde. (3 marks)
    - (iii) Health effects to human body. (3 marks)
    - (iv) How you can be exposed to formaldehyde? (3 marks)
    - (v) Suggest **THREE (3)** solutions to overcome formaldehyde problems. (3 marks)

- Q4** Indoor air quality (IAQ) refers to quality of air inside buildings served by common air-conditioning/ mechanical ventilation system. Good IAQ is desired for healthy indoor environment. Hence, IAQ and HVAC are closely related.
- (a) Define Air Change Effectiveness (ACE). (5 marks)
  - (b) Explain with an illustration, the best practices of ventilation flow pattern by underfloor ducting air-conditioning system. (10 marks)
  - (c) The phenomena by short circuiting of fresh air supply from HVAC system will influence the IAQ. With sketches, describe how HVAC design become the causes of this problems. (10 marks)

**Q5** The purpose of the Occupational Safety and Health Act 1994 (Act 514) for the employer and occupier are to provide a safe workplace and guidance on improving the IAQ with minimum standard. You are required to write a procedure of IAQ audit based on JKKP-DP(S) 2010. Briefly investigate the main IAQ process below:

- (a) Establishment of complaint procedures. (5 marks)
- (b) Explain **THREE (3)** investigation processes. (15 marks)
- (c) Assessment report. (5 marks)

- END OF QUESTIONS-