UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017

COURSE NAME	:	INDOOR AIR QUALITY
COURSE CODE	:	BNB 40103
PROGRAMME	:	4 BNB
EXAMINATION DATE	:	JUNE 2017
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) Define thermal comfort by ASHRAE and state the seven point scale.

(3 marks)

(b) Sketch and identify **FOUR (4)** mechanism in body heat exchange that influence heat loss.

(4 marks)

(c) Explain **THREE (3)** main factors affecting thermal comfort.

(12 marks)

(d) By referring Figure Q1(d) and Table 1.0, estimate clo value for person A, B and C.

(6 marks)

Q2 (a) Define Indoor Air Quality (IAQ).

(2 marks)

(b) List out **THREE (3)** standards related with indoor air quality.

(3 marks)

(c) Explain how IAQ was in good quality.

(5 marks)

(d) Identify and briefly discuss **FIVE (5)** common causes of poor IAQ.

(10 marks)

(e) Is there a test that can find an IAQ problem?

(5 marks)

Q3 (a) Identify how indoor air can be contaminate.

(5 marks)

(b) Classify **FIVE (5)** sources from outdoor and **FIVE (5)** sources from indoor that causes discomfort.

(5 marks)

(c) Differentiate **THREE (3)** common pollutant categories and state **TWO (2)** examples related with building for each categories.

(9 marks)

(d) From answer Q3 (c), recommend **TWO (2)** solutions for each categories.

(6 marks)

Q4   (a)   Discuss relationship between:

    (i)   Ventilation and IAQ.

    (ii)   Moisture control and air-conditioning.

(7 marks)

(b)   In ventilation effectiveness, there are two types of system ability. With an illustration discuss these **TWO (2)** types of ventilation effectiveness.

(10 marks)

(c)   List out **THREE (3)** pollution concentration area currently take into account to calculate ventilation effectiveness.

(3 marks)

(d)   Decide the best air flow pattern in a house.

(5 marks)

Q5   (a)   Briefly explain the important of air change per hour (ACH).

(5 marks)

(b)   Determine ACH in SI units for a room 3500 m^3 with an air flow of 1.5 m^3/s.

(3 marks)

(c)   State the purposes of IAQ assessment, scope and application.

(6 marks)

(d)   Draw a flow chart included three categories in IAQ assessment process.

(11 marks)

- END OF QUESTION-

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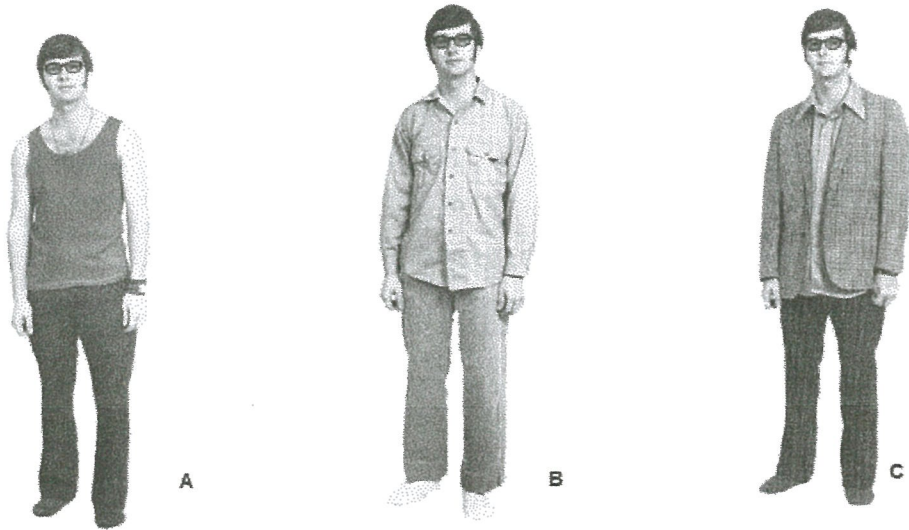

Figure Q1 (d) Clothing Insulation

Table 1.0 Garment Insulation from ASHRAE Handbook 2005.

	clo	check		clo	check
Underwear			**Dress and Skirts**		
Bra	0.01	☐	Skirt (thin)	0.14	☐
Panties	0.03	☐	Skirt (thick)	0.23	☐
Men's briefs	0.04	☐	Sleeveless, scoop neck (thin)	0.23	☐
T-shirt	0.08	☐	Sleeveless, scoop neck (thick)	0.27	☐
Half-slip	0.14	☐	Short-sleeve shirtdress (thin)	0.29	☐
Long underwear bottoms	0.15	☐	Long-sleeve shirtdress (thin)	0.33	☐
Long underwear top	0.20	☐	Long-sleeve shirtdress (thick)	0.47	☐
Footwear			**Trousers and Coveralls**		
Ankle-length athletic socks	0.02	☐	Short shorts	0.06	☐
Pantyhose/stockings	0.02	☐	Walking shorts	0.08	☐
Sandals/thongs	0.02	☐	Straight trousers (thin)	0.15	☐
Shoes	0.02	☐	Straight trousers (thick)	0.24	☐
Calf-length socks	0.03	☐	Sweatpants	0.28	☐
Knee socks (thick)	0.06	☐	Overalls	0.30	☐
Boots	0.10	☐	Coveralls	0.49	☐
Shirts and Blouses			**Suit Jackets and Vests**		
Sleeveless/scoop-neck blouse	0.12	☐	Sleeveless vest (thin)	0.10	☐
Short-sleeve knit sport shirt	0.17	☐	Sleeveless vest (thick)	0.17	☐
Short-sleeve dress shirt	0.19	☐	Single-breasted (thin)	0.36	☐
Long-sleeve dress shirt	0.25	☐	Single-breasted (thick)	0.44	☐
Long-sleeve flannel shirt	0.34	☐	Double-breasted (thin)	0.42	☐
Long-sleeve sweatshirt	0.34	☐	Double-breasted (thick)	0.48	☐
Sweaters					
Sleeveless vest (thin)	0.13	☐			
Sleeveless vest (thick)	0.22	☐			
Long-sleeve (thin)	0.25	☐			
Long-sleeve (thick)	0.36	☐			