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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER 2
SESSION 2018/2019**

COURSE NAME : THERMAL ENVIRONMENTAL
DESIGN

COURSE CODE : BDE 40903

PROGRAMME : BDD

EXAMINATION DATE : JUNE/ JULY 2019

DURATION : 3 HOURS

INSTRUCTION : ANSWER FIVE (5) QUESTIONS
ONLY

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

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TERBUKA

Q1 (a) Evaluate the difference of contents between ISO 7730-2005 standard with ASHRAE 55-2013 standard. (8 marks)

(b) Differentiate these four type of asymmetry thermal radiation that can cause local thermal discomfort to occupants
(i) Cool wall;
(ii) warm ceiling;
(iii) cool ceiling; and
(iv) warm wall. (12 marks)

Q2 (a) Analyze the progress in adaptive thermal comfort over the past two decades. (12 marks)

(b) There may be insufficient opportunity for adaptive action to be fully effective. It may be constrained by several factors. Elaborate the related constraints in execution of effective adaptive thermal comfort with examples. (8 marks)

Q3 (a) Explain by using flow chart the assessment of heat stress according to Wet Bulb Globe Temperature (WBGT) method. (8 marks)

(b) A mechanic is working on mobile diesel equipment in the field away from the workshop. The task involves servicing the diesel engine, a process which takes about two hours, and is normally done at the start of each shift. In this case the worker commences his task at 2 pm which is the hottest part of the day. Some surfaces (exhaust, engine, etc.) are hot to touch and the process involves moderate work such as climbing and descending to gain access to components.

The work site is situated about 2 km from the workshop. The mechanics is acclimatized and has attended a training session on thermal stress. He is wearing a single layer long shirt and trousers and a respirator is not required.

The work rate is moderate, there is a light breeze and the WBGT has been measured at 26.9°C. Using the information in **Table Q3(b)**, evaluate the potential risk of heat stress to the mechanics and provide the suitable administrative control to avoid heat induced illness.

Table Q3(b)

% WORK	SCREENING TLV				SCREENING AL			
	LIGHT	MODERATE	HEAVY	VERY HEAVY	LIGHT	MODERATE	HEAVY	VERY HEAVY
75-100	31.0	28.0	-	-	28.0	25.0	-	-
50-75	31.0	29.0	27.5	-	28.5	26.0	24.0	-
25-50	32.0	30.0	29.0	28.0	29.5	27.0	25.5	24.5
0-25	32.5	31.5	30.5	30.0	30.0	29.0	28.0	27

(12 marks)

- Q4** (a) Distinguish these three type of indoor contaminants that can lead to indoor air quality problem.
- (i) Chemical contaminants;
 - (ii) physical conditions; and
 - (iii) biological agents.

(10 marks)

- (b) Discuss on the three different type of wind driven natural ventilation (single sided, cross and stack ventilation) and its advantage

(10 marks)

- Q5** (a) You had been hired as a thermal comfort assessor for a recording studio in Kuala Lumpur. The recording studio operates 24 hour per day, 6 days per week. However, some of the staff often complain of discomfort and feeling too cold during early morning from 1.00 to 4.00 a.m. As the thermal comfort assessor; propose thermal comfort investigation and assessment that you will conduct.

(12 marks)

- (b) The Standard Effective Temperature (SET) model is used to evaluate all cases of comfort under elevated air speed above 0.2 m/s (40fpm). Express the determination of limits to airspeed inputs in Standard Effective Temperature (SET) model by using flowchart.

(8 marks)

Q6 (a) You had been hired as a indoor air quality assessor for a condominium unit in Selangor. The condominium unit is served by several split unit air conditioning system. The condominium unit also equipped with kitchen hood system. However, the occupants in the investigated condominium unit often complain about dizziness, headache and blocked nose.

(i) As the indoor air quality assessor; propose indoor air quality investigation and assessment that you will conduct.

(10 marks)

(ii) Propose several solutions on improving the indoor air quality in the condominium unit based on the possible indoor pollutants exists in the workplace.

(10 marks)

- END OF QUESTION -