UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME	:	ENVIRONMENTAL RISK ASSESSMENT
COURSE CODE	:	BNA 30903
PROGRAMME CODE	:	BNA
EXAMINATION DATE	:	JUNE/JULY 2018
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTIONS	:	ANSWER **ALL** QUESTIONS

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

Q1   (a)   Define the meaning of hazard identification.

(3 marks)

(b)   Identify **THREE (3)** methods that can be used in hazard identification process.

(6 marks)

(c)   Demonstrate the HAZOP process as one of the method used in hazard identification process.

(10 marks)

(d)   Distinguish the difference between toxicants, toxins and poisons.

(6 marks)

Q2   (a)   Differentiate between acute, sub-chronic, and chronic exposures.

(6 marks)

(b)   Describe the following terms:
(i)   Exposure routes
(ii)   Receptors
(iii) Exposure assessment

(9 marks)

(c)   Sheila drinks water from a contaminated well for 30 years. The resulting dose rate changes because the concentration of the contaminant in the well decreases with time. If the dose rate is given by

$\dot{D}(t) = 0.05 \exp(-t/7000d), mg(c)/kg.d$, where t has unit of days, find the following:

(i)   The total dose
(ii)   The dose rate averaged over the exposure period (i.e. average daily dose)
(iii) The dose averaged over an averaging time of 70 years (i.e. lifetime average daily dose)

(10 marks)

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Q3   (a)   Analyze the difference between Quantal and Graded dose-response curves.

(6 marks)

(b)   A 50 years old man with a heart problem is to be treated with a diuretic drug. Drugs X and Y have the same mechanism of diuretic action. Drug X in a dose of 10mg produces the same magnitude of diuresis as 1000mg of drug Y.

(i)   State which drug is less efficacious.

(ii)   State which drug is more potent.

(iii)   State which drug has a lower toxicity.

(iv)   State which drug is safer.

(v)   State which drug will have a longer duration of action.

(10 marks)

(c)   Briefly describe the term Therapeutic Index (TI).

(3 marks)

(d)   Define the following terms:

(i) LD_{50}

(ii) ED_{50}

(iii) TD_{50}

(6 marks)

Q4   (a)   Define the meaning of Risk Characterization.

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(3 marks)

(b)   Based on experiments with mice, a human threshold dose for chronic ingestion exposure to an organic solvent is estimated to be 42mg/(kg.d). An assessment of exposure to contaminated groundwater indicates that a reasonable maximum exposure level to the solvent in contaminated groundwater was 0.894mg/(kg.d). Calculate the daily margin of safety at this level of exposure.

(4 marks)

(c)　　A population is exposed to polychlorinated biphenyls at a dose of 7×10^{-5} mg/(kg.d) and dieldrin at a dose of 4×10^{-6} mg/(kg/d). Assume that the cancer slope factor for the PCB is $4.34(mg/(kg.d))^{-1}$ and for dieldrin is $30 \ (mg/kg.d))^{-1}$

　　　　(i)　　Calculate the combined risk of these two contaminants (Assumption: cancer risk from this two mixture is additive).

　　　　　　　　　　　　　　　　　　　　　　　　　　　　(4 marks)

　　　　(ii)　　If 10,000 people are exposed at this level, calculate the upper bound on the number of contaminant-induced cancers.

　　　　　　　　　　　　　　　　　　　　　　　　　　　　(2 marks)

(d)　　Identify the exposure duration as stated by the Environmental Protection Agency in 2002.

　　　　　　　　　　　　　　　　　　　　　　　　　　　　(6 marks)

(e)　　Demonstrate **THREE (3)** factors affecting risk

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- **END OF QUESTIONS-**

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FINAL EXAMINATION

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LIST OF FORMULAS

$$D_T = \int_0^{t_e} \dot{D}(t)\,dt$$

$$\widetilde{D} = \frac{\int_0^{t_e} \dot{D}(t)\,dt}{t_{avg}} = \frac{D_t}{t_{avg}}$$

$$\int e^{-x}\,dx = -e^{-x}$$

$$\int e^{ax}\,dx = \frac{1}{a}e^{ax}$$

$$R \approx \rho D$$

$$R \approx \rho E$$

$$I = RP$$

$$I = \rho D P$$

$$I - \rho E P$$

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