Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023

COURSE NAME	:	ROAD SAFETY ENGINEERING
COURSE CODE	:	BFT 40603
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	FEBRUARY 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER ALL QUESTIONS
		2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK.**
		3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **SEVEN** (7) PAGES

Q1 (a) Road signage is an important tool to ensure smooth and safe traffic movement and operation for road users. Illustrate the details of road signage for a minor rural junction according to Public Work Department practice.

(10 marks)

(b) Due to the pandemic COVID-19 and the implementation of the Movement Control Order (MCO) in the year 2020, road accident fatality declined to 4,634 compared to 6,167 in 2019. However, the fatality trend is back on to incline again since last year. Suggest with justification, about the Malaysian government should be implemented a safety system approach in the Global Plan the Second Decade of Action for Road Safety 2021-2030.

(9 marks)

(c) In 2007, the Malaysian Institute of Road Safety Research (MIROS) was established by the Ministry of Transport. MIROS has three main departments to carry out its research activities. Explain the functions of **TWO (2)** departments only.

(6 marks)

Q2 (a) Illustrate step by step the production of an accident database system in Malaysia.

(8 marks)

(b) **Table Q2(b)** shows data on accidents number and hourly traffic volume from KM23 to KM31 along Federal Route F050 (Parit Raja – Air Hitam). The data are needed to study whether the traffic volume might contribute to the number of accidents.

(i) Calculate the correlation coefficients.

(8 marks)

(ii) Develop a simple linear regression model to determine the relationship.

(6 marks)

(iii) Analyse the coefficient of determination (R^2) of the model.

(3 marks)

Q3 (a) Describe the features and functions of Microcomputer Accident Analysis Package (MAAP) software.

(6 marks)

(b) Prior to carrying out an in-depth investigation at any site blackspot location, it is needed to check whether the site has a higher accident number than average. **Table Q3 (b)** shows accident frequency along KM 15 to KM 30 of Federal Route F023 in 3 years period.

(i) Calculate the coefficient of variation.

(8 marks)

(ii) Examine which section is needed for further investigation.

(3 marks)

(c) **Table Q3 (c)** shows accident numbers before and after engineering treatments at selected blackspot areas and control areas. By using the Chi-Square test, determine if there is any significant effect due to the treatment.

(8 marks)

Q4 (a) Road Safety Audit (RSA) is a formal examination of the new road project and the existing road that involves several stages. Briefly explain RSA for Stage 1 to Stage 2.

(8 marks)

(b) There are two scheme accident treatments to be proposed at a junction with a high rate of accidents as follows:

Scheme A:

- Cost of junction redesign is RM 250,000 within 1 year completion,
- Annual maintenance cost is RM 15,000 for the next 5 years after installation,
- Estimated benefit of treatment around RM 66,000 for 2 years followed by RM 33,000 for the remaining 3 years.

Scheme B:

- Cost of junction redesign is RM 200,000 within 1-year completion,
- Annual maintenance cost is RM 20,000 for the next 5 years after installation,
- Estimated benefit of treatment around RM 60,000 for 2 years followed by RM 30,000 for the remaining 3 years.

If the interest rate of 12% within 6 years,

(i) Calculate the Net Present Value (NPV).

(14 marks)

(ii) Decide which scheme will be selected.

(3 marks)

- END OF QUESTIONS -

FINAL EXAMINATION

SEMESTER/SESSION : I / 2022/2023
COURSE NAME : ROAD SAFETY ENGINEERING
PROGRAMME CODE : BFF
COURSE CODE : BFT 40603

TABLE Q2 (b): Number of accidents and hourly traffic volume

Section (KM)	Accident No.	Hourly Traffic Volume
23	79	1726
24	88	1623
25	68	1453
26	77	1756
27	96	2295
28	72	2328
29	65	2285
30	101	2443
31	98	2475

TABLE Q3 (b): Accident frequency along KM 15 to KM 40 (F023 in 3 years)

KM Post	Total (Accidents)	KM Post	Total (Accidents)
15	0	28	8
16	4	29	6
17	12	30	9
18	1	31	2
19	28	32	9
20	3	33	7
21	16	34	2
22	12	35	11
23	0	36	5
24	16	37	2
25	2	38	8
26	2	39	0
27	0	40	2

FINAL EXAMINATION

SEMESTER/SESSION : I / 2022/2023
COURSE NAME : ROAD SAFETY ENGINEERING
PROGRAMME CODE : BFF
COURSE CODE : BFT 40603

TABLE Q3 (c): Accident data record before and after treatment

	Blackspot location	Control location
Before Treatment	25	377
After Treatment	9	289

FINAL EXAMINATION

SEMESTER/SESSION	:	I / 2022/2023	PROGRAMME CODE	:	BFF
COURSE NAME	:	ROAD SAFETY ENGINEERING	COURSE CODE	:	BFT 40603

Appendix A: Formulas

$$b = \frac{SS_{xy}}{SS_{xx}} \qquad a = \bar{y} - b\bar{x}$$

$$SS_{xy} = \sum xy - \frac{\left(\sum x\right)\left(\sum y\right)}{n} \qquad SS_{xx} = \sum x^2 - \frac{\left(\sum x\right)^2}{n}$$

$$\bar{x} = \frac{\sum x_i}{n}$$

$$SS_{yy} = \sum y^2 - \frac{\left(\sum y\right)^2}{n}$$

$$R^2 = \frac{b \times SS_{xy}}{SS_{yy}} \qquad \sigma = \sqrt{\frac{\sum x^2 - n\bar{x}^2}{n-1}} \qquad C_v = \frac{\sigma}{\bar{x}}$$

$$\chi^2 = \frac{\left(|ad - bc| - \frac{n}{2}\right)^2 n}{efgh} \qquad r = \frac{SS_{xy}}{\sqrt{SS_{xx} SS_{yy}}}$$

$$(F/P) = (1+i)^n \qquad (P/F) = \frac{1}{(1+i)^n}$$

$$(A/P) = \frac{i(1+i)^n}{(1+i)^n - 1} \qquad (P/A) = \frac{(1+i)^n - 1}{i(1+i)^n}$$

$$NPV = \sum_{t=1}^{t=n} \frac{(Benefit - Cost\ )}{(1+r)^n} \qquad CBR = \frac{\sum_{t=1}^{t=n} \frac{(Benefit)}{(1+r)^n}}{\sum_{t=1}^{t=n} \frac{(Cost)}{(1+r)^n}}$$