



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

- COURSE NAME : ROAD SAFETY ENGINEERING
- COURSE CODE : BFT 40603
- PROGRAMME CODE : BFF
- EXAMINATION DATE : JULY 2024
- DURATION : 3 HOURS
- INSTRUCTIONS :
1. ANSWER ALL QUESTIONS
 2. THIS FINAL EXAMINATION IS CONDUCTED VIA
 - Open book
 - 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 SIX (6) PAGES

- Q1**
- (a) The Malaysian government has launched the National Road Safety Plan 2022-2030 and in-line with the Global Plan for the Second Decade of Action for Road Safety 2021-2030 by the United Nations and World Health Organization. Discuss **THREE (3)** most important strategies that could be undertaken by the government to achieve the vision of the plan.
(9 marks)
- (b) 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 Works Department practice.
(10 marks)
- (c) Two people were traveling at 120-130 km/h for the past 10km after leaving a bar where they had an excessive drink. The driver loses control on a sharp curve and the vehicle strikes a tree. The passenger is partly ejected and killed. The driver had minor injuries. The rescue team arrived one hour later. Based on the above statement, analyse the incident using the Haddon Safety Planning Matrix.
(6 marks)
- Q2**
- (a) The Microcomputer Accident Analysis Package (MAAP) software is designed to assist in analysing and displaying traffic accidents data. With the help of a schematic diagram, describe the features and functions of the software.
(7 marks)
- (b) **Table Q2.1** shows data on number of accidents and hourly traffic volume from KM23 to KM31 along Federal Route F050 (Parit Raja – Air Hitam). The data is required to examine if there is a relationship between traffic volume and the frequency of accidents.

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Table Q2.1 Number of accidents and hourly traffic volume

Section (KM)	Number of Accidents	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

- (i) Calculate the coefficients of correlation. (9 marks)
- (ii) Develop a simple linear regression model to determine the relationship between number of accidents and hourly traffic volume. (6 marks)
- (iii) Evaluate the coefficient of determination (R^2) of the model. (3 marks)

- Q3**
- (a) The initial assessment and data collection process is conducted immediately after a traffic accident occurs. Suggest and explain the parameters for searching and compiling individual accident records. (6 marks)
 - (b) Driving a vehicle in drowsy condition could lead to severe consequences loss control of the vehicle and no braking response. Suggest and explain **FOUR (4)** a possible remedy to prevent the accidents in future. (8 marks)
 - (c) Before carrying out an in-depth investigation at any site of the blackspot location, it is needed to check whether the site has a higher accident number than average. **Table Q3.1** shows accident frequency along KM 26 to KM 50 of Federal Route F050 for 5 years.

Table Q3.1 Accident frequency along KM 25 to KM 50 (F050) in 5 years

KM Post	Total (Accidents)	KM Post	Total (Accidents)
25	3	38	8
26	5	39	6
27	11	40	9
28	3	41	4
29	21	42	9
30	6	43	7
31	18	44	2
32	15	45	13
33	2	46	6
34	16	47	3
35	4	48	8
36	5	49	1
37	1	50	3

- (i) Calculate the coefficient of variation. (8 marks)
- (ii) Examine whether there is a need for further investigation. (3 marks)

- Q4**
- (a) You are being appointed as a Road Safety Auditor for a new road project in Kota Tinggi district with 25 KM total length. The road is designed for Sub-rural standards with a 70 to 90 km/h speed limit, and it is a dual carriageway road. Propose Road Safety Audit (RSA) activities for Stage 1. (10 marks)
 - (b) **Table Q4.1** shows the number of accidents before and after engineering treatments at selected blackspot areas and control areas. By using the Chi-Square test, determine if there are any significant changes before and after treatment was carried out. (7 marks)

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Table Q4 .1 Accident data recorded before and after treatment.

	Blackspot location	Control location
Before Treatment	53	190
After Treatment	23	108

- (c) After an accident investigation was carried out at several primary school zones along a state road, there were three proposals to improve road safety at the school zones:

Treatment A: Introduce vertical traffic calming.

Cost of treatment = RM 600,000

No. of casualties saved = 12 cases over 3 years,

Treatment B: Introduce signalized pedestrian crossing.

Cost of treatment = RM 1,200,000

No. of casualties saved = 21 cases over 3 years,

Treatment C: Introduce pedestrian footpath.

Cost of treatment = RM 900,000

No. of casualties saved = 15 cases over 3 years,

If the single cost of casualties is worth RM 200,000:

- (i) Calculate the percentage First Year Rate of Return (FYRR) for all treatments. (6 marks)
- (ii) Based on **Q4. (c)(i)**, determine which treatment provide the most benefit. (2 marks)

(2 marks)

- END OF QUESTIONS -

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APPENDIX A

Formulas

$$b = \frac{SS_{xy}}{SS_{xx}}$$

$$a = \bar{y} - b\bar{x}$$

$$SS_{xy} = \sum xy - \frac{(\sum x)(\sum y)}{n}$$

$$SS_{xx} = \sum x^2 - \frac{(\sum x)^2}{n}$$

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

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

$$R^2 = \frac{b \times SS_{xy}}{SS_{yy}}$$

$$\sigma = \sqrt{\frac{\sum x^2 - n\bar{x}^2}{n-1}}$$

$$C_v = \frac{\sigma}{\bar{x}}$$

$$\chi^2 = \frac{\left(|ad - bc| - \frac{n}{2} \right)^2}{efgh} n$$

$$r = \frac{SS_{xy}}{\sqrt{SS_{xx} SS_{yy}}}$$

$$(F/P) = (1+i)^n$$

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

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

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

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

$$BCR = \frac{\sum_{t=1}^{t=n} \frac{(\text{Benefit})}{(1+r)^n}}{\sum_{t=1}^{t=n} \frac{(\text{Cost})}{(1+r)^n}}$$