Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME	:	ROAD SAFETY ENGINEERING
COURSE CODE	:	BFT 40603 / BFT 4063
PROGRAMME	:	4 BFF
EXAMINATION DATE	:	DECEMBER 2013/JANUARY 2014
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **NINE (9)** PAGES

Q1 (a) Road signage is an important tool to ensure a smooth and safe traffic movement and operation to road users. Draw and highlight the road signage for a minor rural intersection (curve approach) according to Public Work Department practice.

(10 marks)

(b) A road surface of a particular Parit Hj Kadir junction is suspected to have poor skid resistance. Table **1** shows the accident record related to skidding and no skidding report regarding the junction and other similar junction along Jalan Parit Hj Kadir. Determine whether or not poor skid resistance of road surface is a significant problem for the junction.

(9 marks)

(c) Explain briefly the function of the following agencies who involve in road safety:

(i) Road Safety Department.

(3 marks)

(ii) Highway Planning Unit.

(3 marks)

Q2 (a) Explain the following techniques that are used in prioritisation and ranking of blackspot location:

(i) Nodal Analysis.

(3 marks)

(ii) Cost Analysis.

(3 marks)

(b) List **THREE (3)** independent variables that may be applied in accident prediction model.

(3 marks)

(c) It was reported that accidents occurring along Federal Route 1 (Air Hitam – Yong Peng) were due to lack of gap acceptance particularly at unsignalised junctions. A researcher has investigated whether the gap acceptance to the road accidents. Table **2** shows a record of accident frequency and actual gap within 3 years (2010-2012):

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

(12 marks)

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

(4 marks)

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

(6 marks)

(b) Prior to carrying out in-depth investigation at any site of blackspot location, it is needed to check whether that the site has higher accident number than average. Table **3** shows accident frequency along KM 26 to KM 50 of Federal Route F050 in 5 years period.

(i) Calculate the coefficient of variation.

(9 marks)

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

(3 marks)

(c) Figure **Q3** shows a collision diagram that has been plotted at blackspot location near housing area and primary school in Batu Pahat District. Propose a treatment and sketch new layout to improve the particular blackspot.

(7 marks)

Q4 (a) Table **4** shows accident numbers before and after engineering treatments at selected blackpot area and control areas. By using Chi Square test, determine if there are any significant changes due to the treatment.

(8 marks)

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

Scheme A:

- Cost of junction redesign is RM 250,000 within 1 years 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 year 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 a period of 6 years,

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

(14 marks)

(ii) Decide which scheme will be selected.

(3 marks)

Q5 (a) Briefly explain **FOUR (4)** items in auditing of roadside safety in Road Safety Audit Stage 3.

(8 marks)

(b) Give **FIVE (5)** objectives of traffic management in Road Safety Audit Stage 4.

(5 marks)

(c) Referring to Figure **Q5**, identify and highlight **SIX (6)** deficiencies on the drawing concerning with safety issues in the Road Safety Audit Stage 3.

(12 marks)

- END OF QUESTION -

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Table 1: Accident related to skidding and no skidding report

	Site	Control
Skidding	11	41
No Skidding	8	176

Table 2: Accident data record and actual gap acceptance within 2010 to 2012

Junctions	Accident frequency	Actual Gap (seconds)
1	32	8
2	38	6
3	22	10
4	42	5
5	30	8
6	35	6
7	25	10
8	43	5
9	33	7

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Table 3: Accident frequency along KM 25 to KM 50 (F050 in 5 years)

KM	Total	KM	Total
25	0	38	8
26	4	39	6
27	12	40	9
28	1	41	2
29	28	42	9
30	3	43	7
31	16	44	2
32	12	45	11
33	0	46	5
34	16	47	2
35	2	48	8
36	2	49	0
37	0	50	2

Table 4 Accident data record before and after treatment

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

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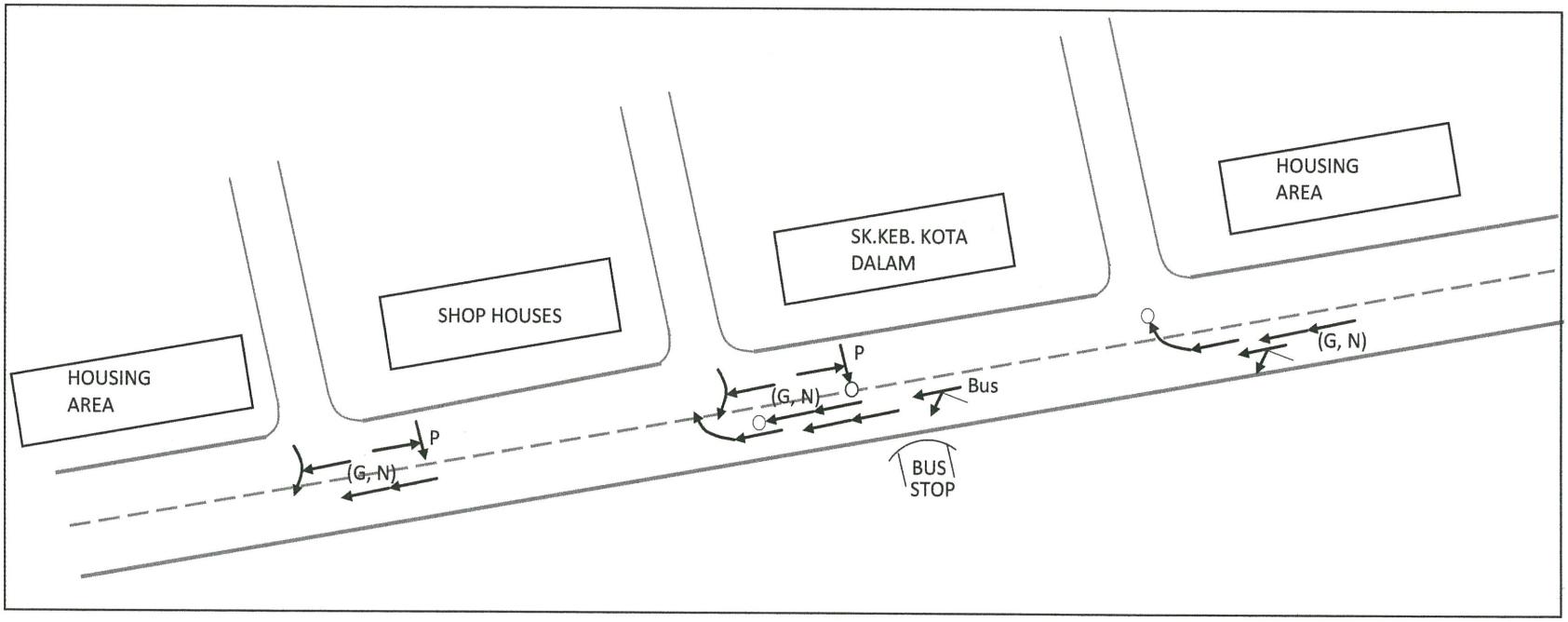

FIGURE Q3

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Name : _____ Matric No. : _____

**Please submit this sheet together with your answer script*

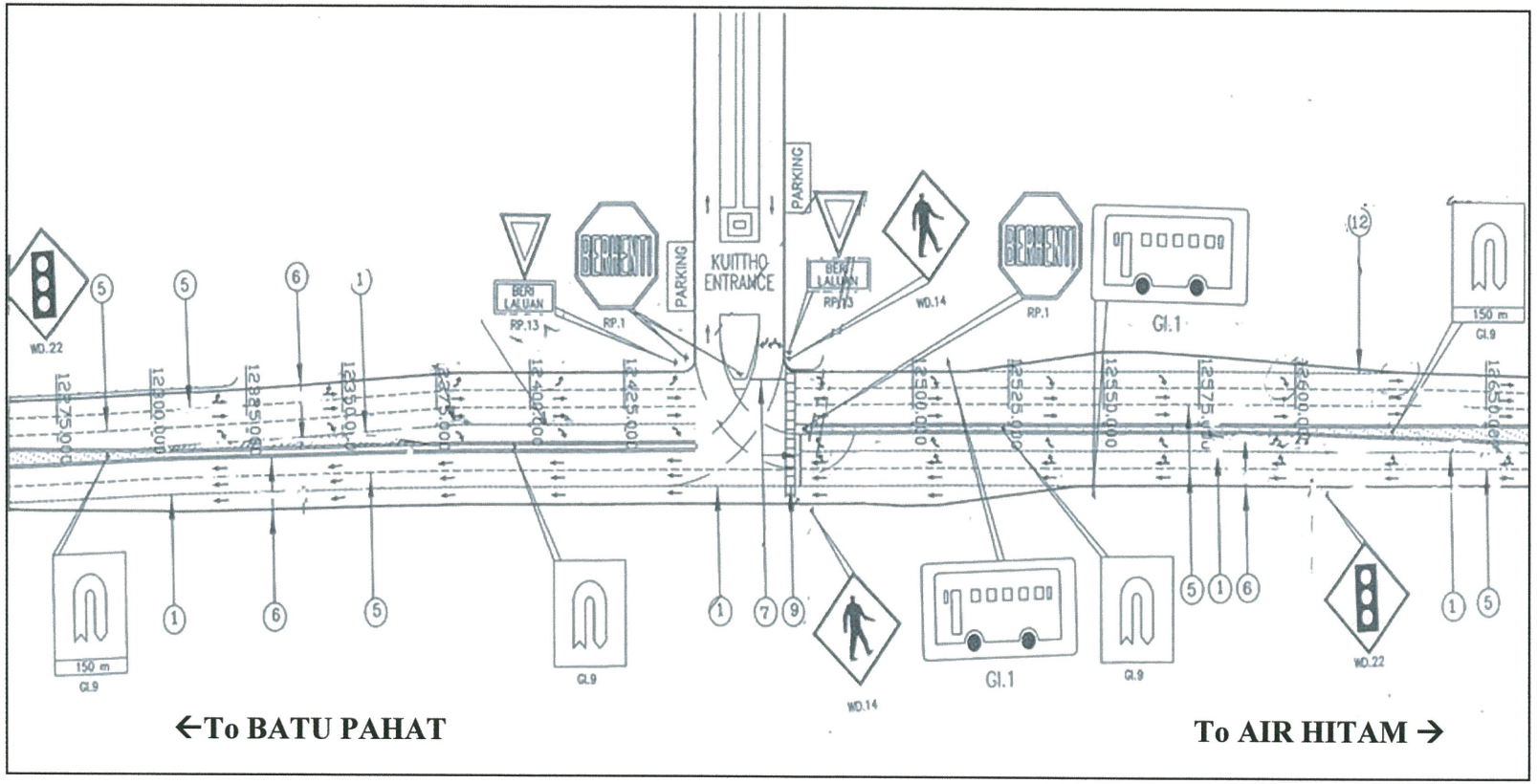

FIGURE Q5

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Formulas:

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

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

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

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

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

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

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