UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	ROAD SAFETY ENGINEERING
COURSE CODE	:	BFT 40603 / BFT4063
PROGRAMME	:	4 BFF
EXAMINATION DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **ELEVEN (11)** PAGES

Q1   (a)   The United Nation General Assembly has made a declaration on road safety issues by launching the Decade Action for Road Safety 2011-2020. Explain briefly **FIVE (5)** basic pillars that must be implemented by each country that supports the declaration.

(10 marks)

       (b)   In 2007, Malaysian Institute of Road Safety Research (MIROS) was established by the Ministry of Transport. MIROS has three main departments to carry out their research activities. Describe the functions of each department.

(9 marks)

       (c)   Explain **THREE (3)** general principles to ensure the effectiveness of traffic signs.

(6 marks)

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

(8 marks)

       (b)   In road accidents modeling technique, multiple regression analysis is often used. Name **TWO (2)** other types of modeling techniques.

(2 marks)

       (c)   It was reported that accidents occurring along Federal Route 24 (Muar – Segamat) were due to over speeding by drivers. A researcher has investigated whether vehicles speed contribute to the road accidents. Table 1 shows a record of accident frequency and 85th percentile speed within 3 years (2009-2011):

           (i)   Develop a simple linear regression model to determine the relationship.
           (ii)   Analyze the coefficient of determination (R^2) of the model.

(15 marks)

Q3   (a)   List **SIX (6)** steps of accident investigation and blackspot treatment.

(6 marks)

       (b)   Figure **Q3** shows a collision diagram at selected blackspot location on a Federal Road in Johor. As a road safety engineer, you have been assigned to look further at the particular blackspot.

           (i)   Perform a preliminary accidents diagnosis.
           (ii)   Suggest in-depth site investigation.

(10 marks)

       (c)   Based on the findings in **Q3 (b)**, propose a low cost countermeasure and sketch your new design to improve the blackspot location.

(9 marks)

Q4 (a) In the 9th Malaysia Plan, a total of RM 55 million allocations were used by the Government to improve the blackspot locations in the country. Since then, the Federal Road was ranked as the road with the highest accidents rate particularly on straight road and in rural areas. Outline the possible cause of accidents and low cost countermeasures to be proposed in rural roads.

(12 marks)

(b) After an accident investigation was carried out at several primary schools area along State Road, there were three proposals to improve road safety among the school students:

Treatment A: Introduce vertical traffic calming
Cost of treatment = RM 360,000
No. of casualties saved = 12 cases over 3 years,

Treatment B: Introduce signalized pedestrian crossing
Cost of treatment = RM 1,500,000
No. of casualties saved = 21 cases over 3 years,

Treatment C: Introduce pedestrian foot path
Cost of treatment = RM 600,000
No. of casualties saved = 15 cases over 3 years,

If the single cost of casualties worth at RM 145,000:

(i) Calculate the percentage First Year Rate of Return (FYRR).
(ii) Determine which treatment would provide the most benefit.

(8 marks)

(c) Due to complaints from local residents and evidence of accidents at KM 21 Route F050 (Batu Pahat to Kluang), the Public Works Department has decided to upgrade the existing priority junction to signalized control junction. The total cost of installation and annual maintenance cost with service life for 10 years is RM 150,000 is RM 10,000 respectively. The estimated benefit of accident reduction is around RM 33,000 per year. If the rate of interest is 8% every year, evaluate the Benefit-Cost Ratio of the upgrading signalized junction.

(5 marks)

Q5   Figure **Q5** shows an existing signalized intersection at a selected location. Road users have complained about the intersection which usually experiences conflicts and congestion during peak hours. You are appointed by JKR as a road safety auditor. Your task is to identify road safety deficiencies through a road safety audit.

(i)   Carry out Road Safety Audit and highlight **FIVE (5)** problems at the intersection which may be potentially hazardous to road users.

(10 marks)

(ii)   Propose a mitigation measure to overcome the problem and sketch your proposal.

(15 marks)

- **END OF QUESTION** -

S1　(a)　Perhimpunan Agung Bangsa-Bangsa Bersatu telah membuat deklarasi ke atas isu keselamatan jalan raya dengan melancarkan Dekad Tindakan untuk Keselamatan Jalan Raya 2011-2020. Terangkan secara ringkas **LIMA (5)** tonggak asas yang perlu dilaksanakan bagi setiap negara yang menyokong deklarasi tersebut.

(10 markah)

(b)　Pada tahun 2007, Institut Penyelidikan Jalan Raya Malaysia (MIROS) telah ditubuhkan oleh Kementerian Pengangkutan. MIROS mempunyai tiga bahagian utama bagi menjalankan aktiviti-aktiviti penyelidikan mereka. Jelaskan fungsi-fungsi setiap bahagian berkenaan.

(9 markah)

(c)　Jelaskan **TIGA (3)** prinsip asas untuk memastikan keberkesanan tanda-tanda lalulintas.

(6 markah)

S2　(a)　Lakarkan langkah demi langkah penghasilan sistem pangkalan data kemalangan jalan raya di Malaysia.

(8 markah)

(b)　Kebiasaannya kaedah analisis regresi berganda sering digunakan dalam teknik pemodelan kemalangan jalan raya. Berikan **DUA (2)** teknik pemodelan selain kaedah tersebut.

(2 markah)

(c)　Kebelakangan ini banyak dilaporkan kemalangan berlaku berpunca daripada pemandu sering memecut di sepanjang Laluan Persekutuan 24 (Muar – Segamat). Seorang penyelidik telah menjalankan siasatan samada faktor kelajuan kenderaan menyumbang terhadap kemalangan tersebut. Jadual **1** menunjukkan rekod kekerapan kemalangan dalam tempoh 3 tahun (2009-2011) dan halaju persentil ke-85:

(i)　Bangunkan model regresi mudah bagi menentukan perhubungannya.
(ii)　Analisiskan pekali penentuan (R^2) model tersebut.

(15 markah)

S3　(a)　Senaraikan **ENAM (6)** langkah-langkah bagi penyiasatan dan rawatan kemalangan jalan raya.

(6 markah)

(b)　Rajah **Q3** menunjukkan sebuah gambarajah perlanggaran di lokasi titik hitam terpilih di Jalan Persekutuan Johor. Sebagai jurutera keselamatan jalan raya, anda telah ditugaskan untuk mengambil tindakan lanjut terhadap lokasi titik hitam tersebut.

(i)　Lakukan diagnosis awal kemalangan di lokasi tersebut.
(ii)　Cadangkan penyiasatan lanjutan.

(10 markah)

(c)　Berdasarkan jawapan dalam S3 **(b)**, cadangkan langkah penyelesaian berkos rendah dan lakarkan rekabentuk baharu untuk menambahbaik lokasi titik hitam tersebut.

(9 markah)

S4 (a) Pada Rancangan Malaysia ke-9, sejumlah RM 55 juta peruntukkan telah dibelanjakan oleh pihak Kerajaan untuk menambahbaik lokasi-lokasi titik hitam dalam negara. Didapati bahawa Jalan Persekutuan menduduki senarai teratas yang mempunyai kadar tertinggi kemalangan terutamanya di jalan lurus dan kawasan luar bandar. Sediakan garis panduan punca kemalangan dan kaedah penyelesaian berkos rendah untuk dicadangkan bagi kawasan luar bandar.

(12 markah)

(b) Selepas satu penyiasatan kemalangan dijalankan di beberapa buah sekolah rendah di sepanjang Jalan Negeri. Terdapat tiga rawatan yang akan dicadangkan untuk menambahbaik keselamatan di kalangan pelajar-pelajar sekolah berkenaan:

Rawatan A: Cadangan penenang trafik tegak
     Kos rawatan = RM 360,000
     Bil. kecelakaan diselamatkan = 12 kes sepanjang 3 tahun,

Rawatan B: Cadangan lintasan pejalan kaki berlampu isyarat
     Kos rawatan = RM 1,500,000
     Bil. kecelakaan diselamatkan = 21 kes sepanjang 3 tahun,

Rawatan C: Cadangan laluan pejalan kaki
     Kos rawatan = RM 600,000
     Bil. kecelakaan diselamatkan = 15 kes sepanjang 3 tahun,

Jika kos tunggal kecelakaan adalah bernilai RM 145,000:

(i) Kirakan peratus Kadar Pulangan Tahun Pertama (FYRR).
(ii) Tentukan rawatan yang paling bermanfaat.

(8 markah)

(c) Ekoran aduan daripada penduduk setempat dan bukti terdapat banyak kemalangan jalan raya di KM 21 Laluan F050 (Batu Pahat ke Kluang), pihak Jabatan Kerja Raya membuat keputusan untuk menaiktaraf persimpangan keutamaan sediada ke persimpangan kawalan lampu isyarat. Jumlah kos pemasangan dan penyenggaraan tahunan masing-masing adalah RM 150,000 dan RM 10,000 dengan hayat perkhidmatan selama 10 tahun. Faedah pengurangan kemalangan dianggarkan dalam RM 33,000 setahun. Jika faedah sebanyak 8% setahun diambilkira, nilaikan Nisbah Faedah-Kos menaiktaraf persimpangan lampu isyarat tersebut.

(5 markah)

S5   Rajah **Q5** menunjukkan satu persimpangan lampu isyarat di kawasan terpilih. Pengguna jalan raya telah membuat aduan bahawa mereka sering mengalami kesesakan dan konflik semasa waktu puncak. Anda dilantik oleh pihak JKR sebagai juruaudit keselamatan jalan raya. Anda ditugaskan untuk mengenal pasti beberapa masalah keselamatan jalan melalui audit keselamatan jalan raya.

(i)   Jalankan audit keselamatan jalan raya dan tunjukkan **LIMA (5)** masalah di persimpangan tersebut berpotensi membahayakan pengguna jalan raya.

(10 markah)

(ii)   Cadangkan langkah penyelesaian untuk menangani masalah tersebut dan lakarkan cadangan anda.

(15 markah)

- SOALAN TAMAT -

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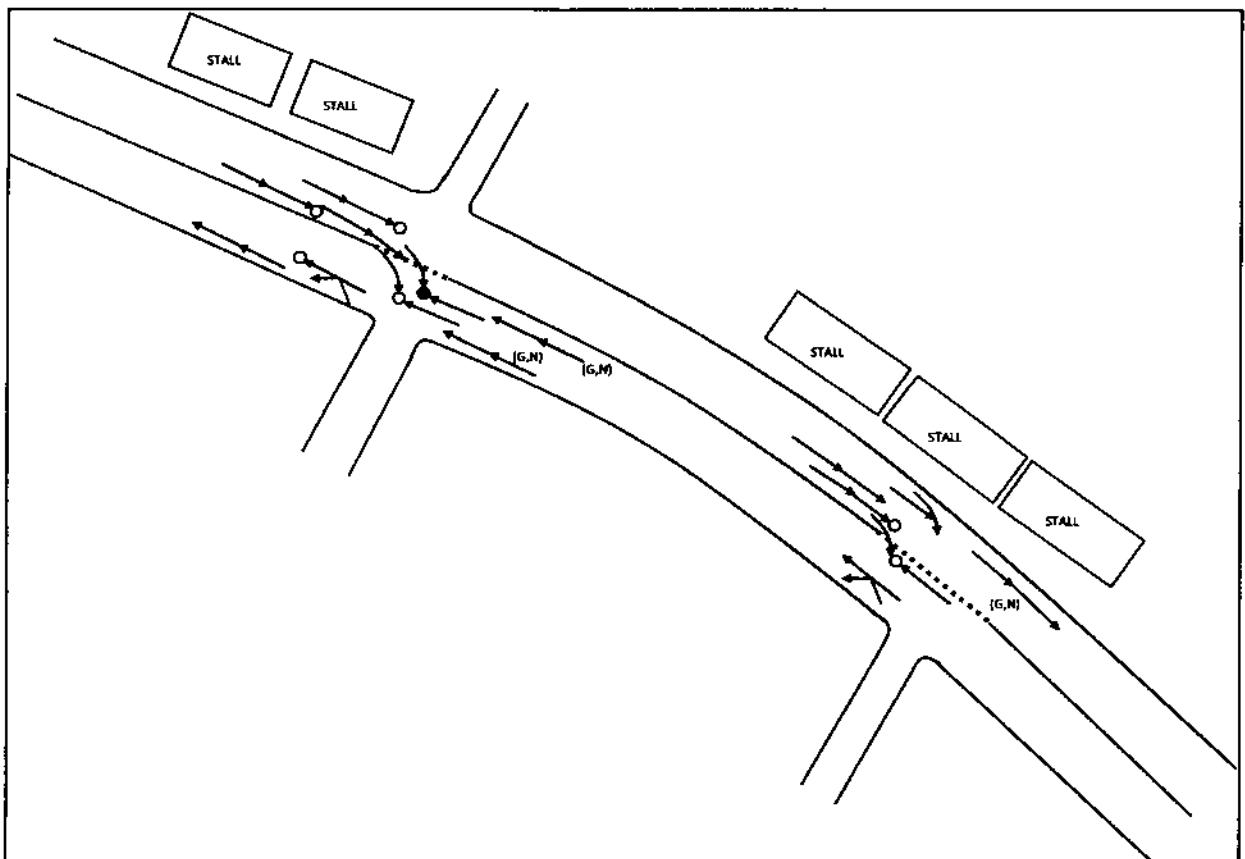COURSE   : ROAD SAFETY   COURSE CODE : BFT40603/BFT4063
                   ENGINEERING

Table 1: Accident data record and vehicles speed within 2009-2011

Section	Accident Rate	85th Percentile Speed (km/h)
1	22	70
2	44	82
3	24	65
4	12	60
5	47	90
6	38	77
7	21	68
8	15	80
9	39	93

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FIGURE Q3

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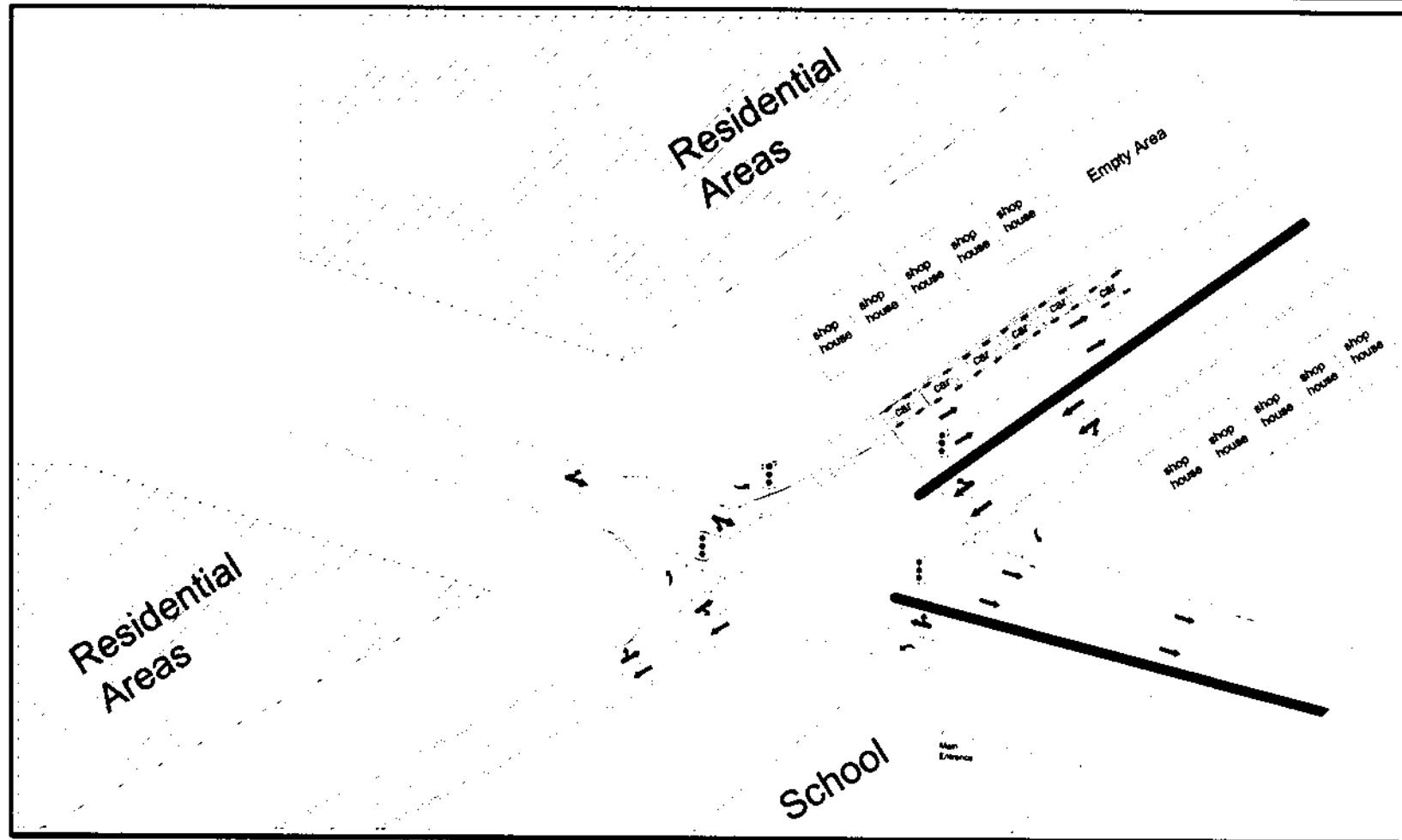
FIGURE Q5

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Formulas:

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

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

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

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

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

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

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