Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2013/14

COURSE NAME	:	ADVANCED TRAFFIC ENGINEERING
COURSE CODE	:	BFT 40503
PROGRAMME	:	4 BFF
DATE	:	JUNE 2014
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

ENGLISH

Q1 (a) Explain in brief the differences between uninterrupted and interrupted flow and give example where those situation can be found

(6 marks)

(b) Based on your answer in **Q1(a)** provide the description of models that best describe Uninterrupted and interrupted traffic flow. Shows the mathematical relationship of q, k and v for both model.

(13 marks)

(c) The speed density relationship of traffic on the Pagoh-Senawang PLUS highway section was estimated to be

$$v_x = 18.2 \ln (^{220}/_{k})$$

i. What is the maximum flow, speed, and density at this flow?
ii. What is the jam density?

(6 marks)

Q2 (a) With suitable example, explain what is gap acceptance and critical gap

(7 marks)

(b) Figure **Q2(a)** shows a plot of time-space within a time-space domain of Formula Ones during Malaysian Grand Prix on International Sepang circuit.

(i) An observer counts six Formula One crossing line A-A' in 25 seconds .

At this point:

a. Calculate the rate of flow (q)
b. Calculate individual and average headway

(9 marks)

(ii) A speed trap consisting of a record of times when vehicle passed two points B-B' was conducted as indicated in the figure. Find the average speed of vehicles 4, 5, 6, 7, 8 and 9. (assume the trap distance is 240m)

(9 marks)

Q3 (a) (i) State **FOUR (4)** factors that should be considered when providing walking and crossing facilities for pedestrians.

(4 marks)

(ii) Explain **THREE (3)** measures that can enhance the ability of pedestrians to cross the road safely.

(6 marks)

(b) The number of private automobiles in your city has been steadily increasing every year, causing major concern about congestion in the city. You, as a traffic engineering consultant, was contacted by your city council and asked to give a talk to the city council board of directors about "Innovative Ways of Reducing Private Automobile Usage". Prepare a draft that explains **FIVE (5)** methods that you will be covering in your talk.

(15 marks)

Q4 (a) A 3-phase signal system is to be designed for an urban intersection. The flow ratios (v/s) are as follows:

Phase 1 $(v/s)_1 = 0.30$
Phase 2 $(v/s)_2 = 0.25$
Phase 3 $(v/s)_3 = 0.35$

If the lost time per phase (l) is 3.0 sec, determine:

(i) The shortest cycle length that will avoid over-saturation.
(ii) The cycle length if the desired critical v/c ratio is 0.85.
(iii) The critical v/c ratio if a cycle length of 120 sec is used. Comment on the value.

(9 marks)

(b) (i) With the help of a diagram, describe a "Multiway Stop-Controlled Intersection".

(3 marks)

(ii) There are three warrants that should be fulfilled in order to allow for the establishment of multiway stop-control for an intersection, which are:

1. The total intersection approach volume should not be less than 500 vehicles for 8 hours of an average day.
2. The combined volume of vehicles and pedestrians from the minor approach should not be less than 200 units for the same 8 hours.
3. The average delay of the vehicles on the minor street should not be less than 30 sec per vehicle during the maximum hour.

Table 3 shows results from a traffic count and delay study conducted at an unsignalised urban residential T-junction. Decide whether this intersection should be turned into multiway stop-controlled intersection or not.

(13 marks)

- END OF QUESTIONS -

BAHASA MELAYU

S1 (a) Terangkan dengan ringkas perbezaan diantara aliran tidak terganggu dan tergangggu dan berikan contoh dimana kedua situasi tersebut boleh ditemui

(6 markah)

(b) Berdasarkan jawapan anda di Q1(a), berikan penjelasan mengenai model yang terbaik bagi menjelaskan aliran tak terganggu dan terganggu. Tunjukkan hubungan matematik bagi q, k dan v untuk kedua-dua model

(13 markah)

(c) Hubungan laju ketumpatan bagi lalulintas diatas lebuhraya LUS Pagoh-Senawang dianggarkan sebagai

$$v_x = 18.2 \ln (^{220}/_{k})$$

i. Apakah aliran, laju dan ketumpatan maksima bagi aliran ini?
ii. Apakah Ketumpatan sesak?

(6 markah)

S2 (a) Dengan contoh sesuai, terangkan apakah itu gap terima dan gap kritikal ,

(7 markah)

(b) Figure **Q2(a)** menunjukkan plot bagi ruang-masa diantara domain ruang-masa bagi Formula One semasa kejohanan GrandPrix Malaysia di atas Litar antarabangsa Sepang

(i) Pemerhati mengira enam Formula One melintasi garis A-A' dalam tempoh 25 saat.

Pada kedudukan ini

a. Kira kadar aliran (q)
b. Kira kepala bagi individu dan purata kepala

(9 markah)

(ii) Perangkap laju dijalankan pada titik B-B' mengandungi rekod masa kenderaan lalu di titik tersebut seperti yang digambarkan dalam rajah. Dapatkan purata laju bagi kenderaan 4, 5, 6, 7, 8 dan 9. (andaikan jarak perangkap laju adalah 240m)

(9 markah)

S3 (a) (i) Nyatakan **EMPAT (4)** faktor yang perlu diambil kira dalam menyediakan kemudahan berjalan dan melintas bagi pejalan kaki.

(4 markah)

(ii) Terangkan **TIGA (3)** langkah yang boleh menambahbaik keupayaan pejalan kaki untuk melintas jalan dengan selamat.

(6 markah)

(b) Bilangan kenderaan persendirian dalam bandar anda semakin tahun semakin meningkat sehingga menyebabkan kebimbangan utama tentang berlakunya kesesakan di bandar. Anda sebagai seorang perunding kejuruteraan trafik telah dihubungi oleh majlis perbandaran untuk memberi satu syarahan tentang "Kaedah Inovatif untuk Mengurangkan Kenderaan Persendirian" kepada lembaga pengarah majlis perbandaran. Sediakan draf yang menerangkan **LIMA (5)** kaedah yang akan anda liputi dalam syarahan anda itu.

(15 markah)

Q4 (a) Satu sistem isyarat 3-fasa akan direkabentuk untuk sebuah persimpangan di bandar. Nisbah aliran (v/s) adalah seperti berikut:

Fasa 1 $(v/s)_1 = 0.30$
Fasa 2 $(v/s)_2 = 0.25$
Fasa 3 $(v/s)_3 = 0.35$

Jika masa hilang bagi setiap fasa (l) ialah 3.0 saat, tentukan:

(i) Tempoh kitaran yang terpendek untuk mengelakkan kejadian lebih tepu.
(ii) Tempoh kitaran yang dikehendaki jika nisbah kritikal v/c ialah 0.85.
(iii) Nisbah kritikal v/c jika tempoh kitaran selama 120 saat digunakan. Berikan komen tentang nilai yang diperolehi.

(9 markah)

(b) (i) Dengan bantuan gambarajah, terangkan "Persimpangan Kawalan Berhenti Arah Berbilang".

(3 markah)

(ii) Terdapat tiga waran yang perlu dipenuhi untuk membenarkan pelaksanaan sebuah persimpangan yang mempunyai kawalan berhenti arah berbilang, iaitu::

1. Jumlah isipadu lengan-lengan persimpangan tidak boleh kurang dari 500 kenderaan untuk 8 jam bagi satu hari yang biasa.
2. Jumlah tergabung kenderaan dan pejalan kaki dari lengan minor tidak boleh kurang dari 200 unit untuk 8 jam yang serupa.
3. Purata kelengahan kenderaan dari lengan minor tidak boleh kurang dari 30 saat setiap kenderaan ketika jam maksima.

Jadual **3** menunjukkan keputusan perhitungan trafik dan kajian kelengahan yang dikendalikan untuk sebuah simpang-T di kawasan perumahan bandaran. Tentukan sama ada persimpangan ini sewajarnya diubah ke persimpangan kawalan berhenti arah berbilang atau tidak.

(13 markah)

- SOALAN TAMAT -

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Figure Q2 : Time-space plot of Formula One paths

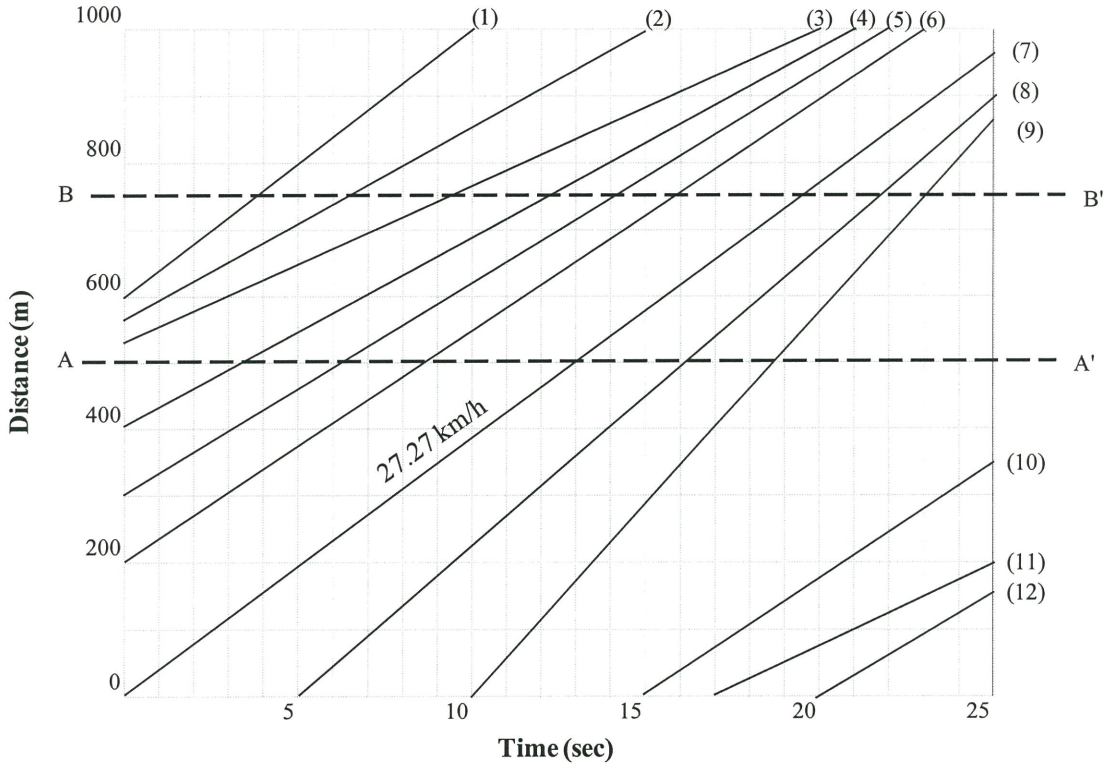

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Table 3: Results of traffic count and delay study at T-junction

Time	8:00 am	9:00 am	10:00 am	11:00 am	12:00 pm	1:00 pm	2:00 pm	3:00 pm
Number of Vehicles (per hour)								
Minor Approach	62	27	18	17	39	10	16	15
Major Approach 1	69	25	27	54	52	27	31	46
Major Approach 2	71	34	38	39	51	18	26	31
Number of Pedestrians (per hour)								
Minor Approach	15	9	10	8	12	9	11	8
Average delay per vehicle (seconds)								
Minor Approach	53	29	20	41	48	25	31	43

Equations that may be useful:

$$\tau_{\min} = \delta + \frac{W+L}{v_o} + \frac{v_o}{2a} \qquad C_o = \frac{1.5L+5}{1-Y} \qquad L = \sum l + R$$

$$G_e = \frac{y}{Y}(C-L) \qquad G_a = G_e + l - \tau \qquad G_p = 3.2 + \frac{L}{S_p} + \left(2.7\frac{N_{ped}}{W_E}\right)$$

$$G_p = 3.2 + \frac{L}{S_p} + \left(0.27N_{ped}\right) \qquad X_c = \sum\left(\frac{v}{s}\right)_c * \frac{C}{C-L}$$