UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2011/2012

COURSE NAME	:	TRAFFIC ENGINEERING & SAFETY
COURSE CODE	:	BFC 3082
PROGRAMME	:	3 BFF
DATE	:	JANUARY 2012
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** FROM **FIVE (5)** QUESTIONS

THIS PAPER CONISISTS OF **TEN (10)** PAGES

Q1 (a) Refer to Figure **Q1(a)** and;

(i) Explain the situation occurs at A, B, C and D

(4 marks)

(iv) Draw the diagrams that show the relationships between speed - density and speed – flow.

(6 marks)

(b) Figure **Q1(b)** shows a curved segment of a sub-urban two-lane highway in the state of Johore that has lane width 3.5m with radius 40m.

(i) Determine the stopping sight distance that appropriate at this segment.

(5 marks)

(ii) According too many accidents occured at this curve, the town council plans to assign a posted speed limit. Determine the appropriate speed limit at this segment.

(10 marks)

Q2 (a) A car is travelling at 90 km/h on a crest vertical curve connecting grades of +2% and -1%. Length of the curve is 250 m. Further ahead of the car, an object from a truck has fallen onto the travel lane. The height of the object is 80 cm. Eye height is taken as 1.06 m. Ignore the effects of grades on stopping sight distance. Drivers' perception-reaction time is taken as 2.5 seconds. Calculate the minimum length requires for the car to stop safely and avoid colliding with the object.

(5 marks)

(b) Discuss on transition curve.

(2 marks)

(c) Sketch an appropriate diagram showing the relationship between tangent, transition and circular curves.

(3 marks)

(d) The following measurements will be used in the design of a sag vertical curve road construction:

Gradient G_1	= -2.0%
Gradient G_2	= +3.0%
Design speed	= 80 km/h
Elevation at BVC	= 12.50 m
Elevation at EVC	= 13.20 m

(i) Using **Table 1**, design the stations for the sag vertical curve at 20 m intervals.

(ii) Determine the location of the minimum point on the curve.

(iii) Sketch the vertical curve.

(15 marks)

Q3 (a) Improving highway safety involves consideration of elements such as driver, vehicle and roadways. List the **FIVE (5)** highway safety strategies that used as a basic reference

(5 marks)

(b) Explain briefly **FOUR (4)** programmes that can be implemented to increase the motorcycle safety.

(4 marks)

(c) Motorcycling is generally recognized as a relatively risky activity. Previous studies have determined that human factor is the main cause of motorcyclist accident. Based on your knowledge, explain **THREE (3)** of this human factor.

(6 marks)

(d) Sketch **FIVE (5)** layout of interchanges. Describe the characteristic of each interchange.

(10 marks)

Q4 (a) There are several methods that can be used to collect data for parking study analysis. Name one method and describe briefly on how to conduct the parking survey by using that method.

(4 marks)

(b) An office parking garage has the hours of operation from 6:00 to 20:00 and the number of parking bays in the garage is 500. 80% are commuters with average parking duration of 8 hours while 10% are visitors parking for an average of 2 hours. The remaining are shoppers parking for an average of 3 hours. However observations made at the garage indicate that 15% of visitors from 10:00 to 12:00 and from 13:00 to 15:00, do not find parking. Calculate how many additional bays should be added to the garage to meet the demand.

(6 marks)

(c) Accidents and traffic conflicts usually occurs at a four legs junction. In your opinion, describe how a roundabout is more suitable than a traffic signal in order to reduce the road accidents at a junction

(5 marks)

(d) Explain **FOUR (4)** common design elements at roundabout

(4 marks)

(e) Sketch and name types of at grade intersections.

(6 marks)

Q5 (a) Give **THREE (3)** traffic signal warrants should be consider before install any signal control.

(3 marks)

(b) **Table 4** shows traffic flow data and saturation flow for each approach at traffic signal intersection. Amber time, a = 3s , all red interval, R= 2s and driver reaction time, *l*= 2s.

(i) Complete the **Table 4.**

(7 marks)

(ii) Determine optimum cycle time.

(5 marks)

(iii) Determine effective green time, actual green time and controller setting time.

(6 marks)

(iv) Sketch timing schedule.

(4 marks)

S1 (a) Rujuk kepada Rajah **S1 (a)** dan;

(i) Terangkan situasi yang berlaku di A, B, C dan D,

(4 markah)

(ii) Lukiskan graf lengkungan yang menerangkan perkaitan di antara laju – ketumpatan dan laju - aliran

(6 markah)

(b) Rajah **S1(b)** menunjukkan sebatang jalan dua lorong di jalan raya negeri Johor yang mempunyai kawasan lengkung belok selebar 3.5m dengan panjang jejari 40m.

(i) Kirakan jarak penglihatan berhenti yang sesuai bagi kawasan lengkung belok

(5 markah)

(ii) Berikutan terlalu banyak kemalangan jalan raya berlaku di lengkung ini, pihak majlis perbandaran telah memutuskan untuk meletakkan papan tanda had laju. Tentukan had laju yang bersesuaian dengan situasi di lengkung belok tersebut

(10 markah)

S2 (a) Sebuah kereta sedang dipandu pada kelajuan 90 km/j pada lengkung pugak jenis puncak yang menghubungkan kecerunan +2% dan -1%. Panjang lengkung adalah 250 m. Terdapat suatu objek terjatuh di lorong laluan daripada trak di hadapan kereta tersebut. Ketinggian objek tersebut ialah 80 cm. Ketinggian mata ialah 1.06 m. Abaikan kesan kecerunana pada jarak penglihatan berhenti. Masa persepsi-reaksi pemandu ialah 2.5 saat. Kirakan jarak minimum yang diperlukan oleh kereta untuk berhenti dengan selamat tanpa melanggar objek tersebut.

(5 markah)

(b) Bincangkan mengenai lengkung peralihan.

(2 markah)

(c) Lakarkan rajah yang sesuai menunjukkan hubungan antara garis tangen, lengkung peralihan dan lengkung bulat.

(3 markah)

(d) Pengukuran berikut akan digunakan untuk reka bentuk lengkung pugak jenis lendut untuk pembinaan jalan:

Kecerunan G_1	= -2.0%
Kecerunan G_2	=+3.0%
Laju reka bentuk	=80 km/h
Aras ketinggian di BVC	=12.50 m
Aras ketinggian di EVC	=13.20 m

(i) Dengan menggunakan **Jadual 1**, reka bentuk stesyen untuk lengkung lendut pugak pada jarak 20 m.

(ii) Dapatkan lokasi titik minimum pada lengkung.

(iii) Lakarkan lengkung pugak.

(15 markah)

S3 (a) Bagi mempertingkatkan tahap keselamatan lebuhraya, elemen seperti pemandu, kenderaan dan jalan perlu diberi perhation. Senaraikan **LIMA (5)** strategi keselamatan jalan raya yang perlu digunakan sebagai panduan asas.

(5 markah)

(b) Terangkan **EMPAT (4)** program yang boleh digunapakai bagi mempertingkatkan keselamatan penunggang motorsikal

(4 markah)

(c) Memandu motorsikal secara amnya telah dikenal pasti sebagai aktiviti berisiko. Kajian lalu mendapati faktor manusia sebagai punca utama kemalangan motorsikal. Berdasarkan pengetahuan anda, terangkan **TIGA (3)** faktor manusia tersebut

(6 markah)

(d) Lakarkan **LIMA (5)** jenis bentuk persilangan serta terangkan setiap ciri persilangan tersebut.

(10 markah)

S4 (a) Terdapat beberapa kaedah yang boleh digunakan bagi tujuan pengutipan data untuk kajian analisa tempat letak kereta. Namakan satu kaedah dan terangkan bagaimana ia dilakukan.

(4 markah)

(b) Sebuah garaj pejabat beroperasi dari pukul 6:00 pagi ke 8:00 malam dan jumlah ruang parker ialah sebanyak 500. 80% adalah komuter dengan purata jangkamasa meletak kenderaan selama 8 jam, manakala 10% adalah pelawat dengan purata jangkamasa meletak kenderaan selama 2 jam. Seelebihnya adalah pekedai dengan purata 3 jam meletak kenderaan. Walau bagaimanapun, berdasarkan pemerhatian di garaj tersebut, terdapat 15% pelawat dari pukul 10:00 pagi hingga 12:00 tengahari dan 1:00 tengahari hingga 3:00 petang tidak dapat meletak kenderaan mereka. Hitung berapa ruang tempat letak kereta tambahan yang diperlukan bagi memenuhi permintaan meletak kenderaan di garaj tersebut.

(6 markah)

(c) Sebuah persimpangan berlengan empat didapati telah menyebabkan banyak kemalangan dan konflik aliran. Pada pendapat anda mengapa dan bagaimana sebuah bulatan lebih sesuai mengatasi masalah kemalangan di persimpangan tersebut berbanding dengan lampu isyarat.

(5 markah)

(d) Terangkan **EMPAT (4)** elemen reka bentuk utama bagi bulatan.

(4 markah)

(e) Lakar dan namakan jenis-jenis persimpangan searas.

(6 markah)

S5 (a) Berikan **TIGA (3)** waran yang perlu dipertimbangkan sebagai syarat pemilihan pemasangan lampu isyarat.

(3 markah)

(b) **Jadual 4** menunjukkan data aliran trafik dan aliran tepu bagi setiap arah masukan di persimpangan lampu isyarat. Masa kuning, a=3s , semua merah, R= 2s dan masa tindakbalas pemandu, *l= 2*s.

(i) Lengkapkan **Jadual 4.**

(7 markah)

(ii) Kirakan masa kitar optimum.

(5 markah)

(iii) Kirakan masa hijau berkesan, masa hijau sebenar dan masa kawalan set.

(6 markah)

(iv) Lakarkan gambarajah masa.

(4 markah)

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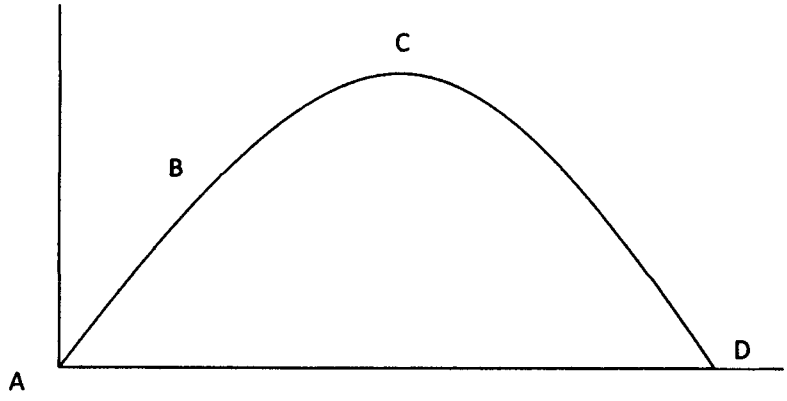
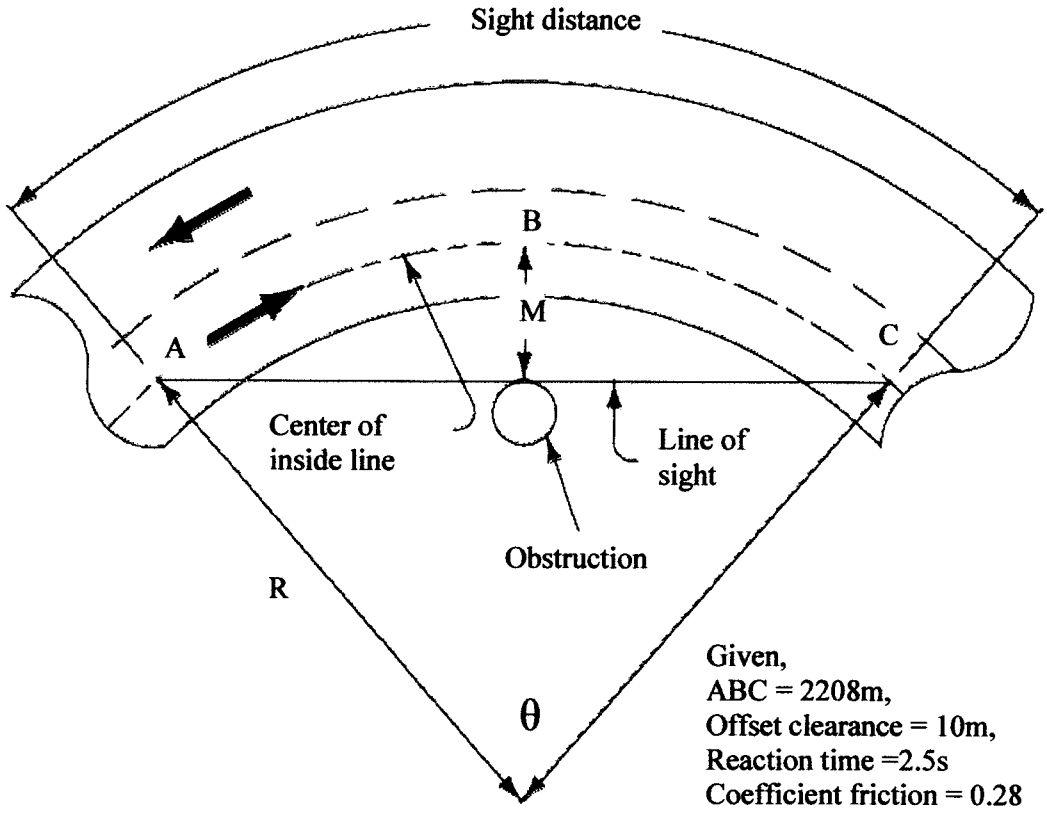


FIQURE Q1(a) : Relationship between tflow and density



FIQURE Q1(b) : Curved segment with Line of Sight and Sight Obstruction

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TABLE 1: Worksheet for the design of sag vertical curve

x	LP	x/L	$(x/L)^2$	$y_n = 4e(x/L)^2$	$L_x = LP + y_n$	Remarks

TABLE 2: Longitudinal coefficient of friction proposed for certain design speeds

Design speed (km/h)	Coefficient of friction, f
50	0.35
60	0.33
70	0.31
80	0.30
90	0.30
100	0.29
110	0.28
120	0.28

TABLE 3: Suggested minimum *k* values for vertical curves (JKR)

Design speed km/h	Minimum *k* value	
	Sag Curve	Crest curve
120	60	120
100	40	60
80	28	30
60	15	15
50	12	10
40	10	10
30	8	5

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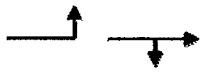
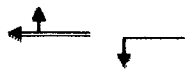
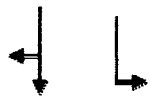
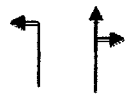
TABLE 4 : Traffic Flow (pcu/hour) and Saturated Flow (pcu/hour) values for each phase and movement.

Phase	Phase 1		Phase 2		Phase 3		Phase 4	
Movement	A	B	A	B	A	B	A	B
								
Traffic Flow, q (pcu/hour)	255	986	457	256	128	146	247	112
Saturated Flow (pcu/hour)	1785	3250	3250	1785	1785	3250	1785	3250
q/S								
Y								