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UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESI 2018/2019**

COURSE NAME : TRAFFIC ENGINEERING AND SAFETY
COURSE CODE : BFC32302
PROGRAMME CODE : BFF
EXAMINATION DATE : DECEMBER 2018/JANUARY 2019
DURATION : 2 HOURS
INSTRUCTION : ANSWER **THREE (3)** QUESTIONS ONLY

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

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Q1 (a) Traffic volume is the number of vehicles passing a given point during a specific period time. List **FOUR (4)** importances of traffic volume study. (4 marks)

(b) Given that 20 vehicles pass a given point in 1 minute and traverse a length of 1 kilometre. Determine flow, q (in vehicles/hour), density, k (in vehicles/km), space mean speed, v (in km/hour) and time headway, h (in second). (5 marks)

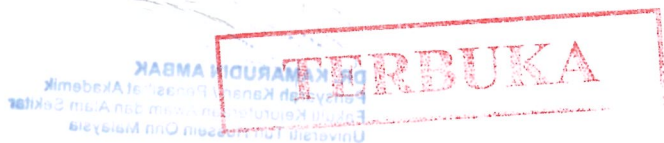
(c) A four-lane urban freeway is to be constructed on rolling terrain. There will be two lanes per direction, each lane having a width of 3.6 m. The highway will have 0.6 m lateral clearance. Up to 0.6 interchanges per km will be permitted for this highway. The followings have been assumed:

- Design hourly volume, V = 1,950 vehicles/hour
- Percentage of trucks and buses, P_T = 5%
- Peak hour factor, PHF = 0.90
- Driver population = All are commuters
- Average passenger car speed, S = Free flow speed, FFS

Predict the level of service of this urban freeway when it begins operation. (16 marks)



- Q2**
- (a) Traffic flow is very high on the PLUS highway during the festive season, causing traffic congestion. Contra flow operation is frequently used for reducing traffic congestion and improves capacity at the suitable location. Describe **FIVE (5)** criteria for contra flow operation.
(5 marks)
 - (b) UTHM main campus has 15739 students and 2320 staff. Based on that numbers, traffic management is very important in UTHM. One of the traffic management category is to allocate priorities. Briefly discuss **TWO (2)** objectives of this category. List **THREE (3)** techniques to be implemented in UTHM campus.
(5 marks)
 - (c) Active Traffic Management (ATM) can be defined as dynamically managing and controlling traffic, based on prevailing conditions. Briefly explain **FIVE (5)** techniques.
(5 marks)
 - (d) The parking survey data were collected from a parking lot at FKAAS complex by using license plate method. The data is shown in **Table 7**. Determine:
 - (i) Average occupancy.
(4 marks)
 - (ii) Average turn over.
(6 marks)



- Q3** (a) Commonly, there are two types of signalised control system namely Pre-timed and Actuated Signal System. Briefly discuss both types of signal control system and give an alternative advanced signal control system.

(7 marks)

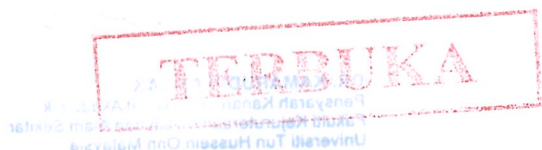
- (b) **Figure Q4(a)** shows the layout of a proposed signalised T-intersection. The saturation flows (S) and demand flows (q) are given in passenger car units per hour (pcu/hr). **Figure Q4(b)** shows the 3-phase signal system that will be applied. Given that the all red time (R) = 2 sec, amber time (a) = 3 sec and driver reaction time (l) = 3 sec. Calculate,

- (i) Optimum cycle time (C_o).

(12 marks)

- (ii) Actual green time (G) for each phase, if the cycle time (C) is taken as 90 seconds.

(6 marks)



- Q4** (a) The United Nation General Assembly had made a declaration on road safety issues by launching the Decade Action for Road Safety 2011-2020. In line with this, Malaysian Government had launched a new National Road Safety Plan 2014-2020 in 2014. State **FOUR (4)** strategic pillars that must be implemented by the country to support the declaration. (4 marks)
- (b) Based on annual road accident statistical report, more than 60% fatalities in road accident are associated with motorcycle users. As a traffic safety engineer in Public Work Department (JKR), briefly discuss a proposal using ‘engineering’ approaches to mitigate the number of motorcycle user’s fatality. (9 marks)
- (c) You are assigned as Team Consultant to look into the safety aspect of existing roads, particularly along the Multilane Highway F050 at KM 21 – KM 31, FT050 (Parit Raja–Parit Abd Hamid). Using Road Safety Audit (RSA) Stage 5 procedure, select **FOUR (4)** significant items and propose a checklist for each activity. (12 marks)

– END OF QUESTIONS –



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TABLE 1 : Adjustment for lane width

Lane Width (m)	Reduction in FFS (km/h)
3.6	0.0
3.5	1.0
3.4	2.1
3.3	3.1
3.2	5.6

TABLE 2 : Adjustment for left shoulder lateral clearance

Right-Shoulder Lateral Clearance (m)	Reduction in Free Flow Speed (km/h)			
	Lanes in One Direction			
	2	3	4	≥ 5
≥ 1.8	0.0	0.0	0.0	0.0
1.5	1.0	0.7	0.3	0.2
1.2	1.9	1.3	0.7	0.4
0.9	2.9	1.9	1.0	0.6
0.6	3.9	2.6	1.3	0.8

TABLE 3 : Adjustment for number of lanes

Number of Lanes (One Direction)	Reduction in FFS (km/h)
≥ 5	0.0
4	2.4
3	4.8
2	7.3



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TABLE 4 : Adjustment for interchange density

Interchanges per km	Reduction in FFS (km/h)
0.3	0.0
0.4	1.1
0.5	2.1
0.6	3.9

TABLE 5 : Passenger car equivalents for trucks and buses extended freeway segments

Factor	Type of Terrain		
	Level	Rolling	Mountainous
E _T (trucks and buses)	1.5	2.5	4.5
E _R (recreational vehicles)	1.2	2.0	4.0

TABLE 6: Level of service criteria

Level of service	Density (pc/km/lane)
A	0 – 7
B	> 7 – 11
C	> 11 – 16
D	> 16 – 22
E	> 22 – 28
F	> 28

TABLE 7: Parking survey data

Bay	Time (A.M.)			
	9:00-9:15	9:15-9:30	9:30-9:45	9:45-10:00
1	1234	5678	-	9101
2	1213	1213	1213	1213
3	1415	1617	1617	1617
4	1819	2021	-	2223
5	2425	2425	-	2627

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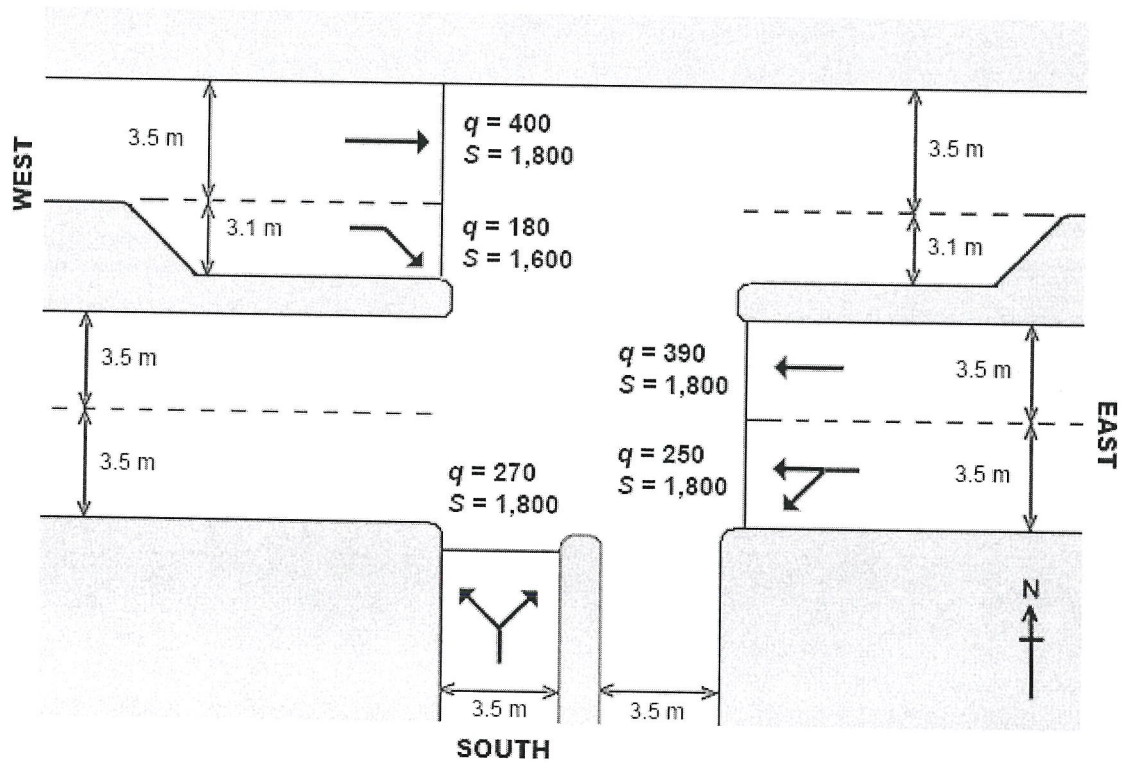


FIGURE Q4(a): Layout of proposed signalised T-intersection

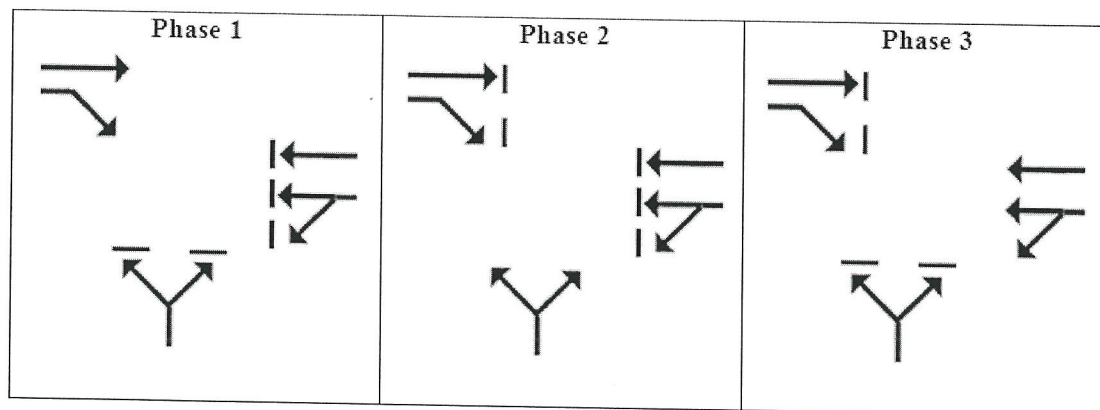


FIGURE Q4(b): Phasing diagram of proposed signal system

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The following information may be useful. The symbols have their usual meaning.

$$q = kv \quad , \quad h = \frac{s}{v}$$

$$k = \frac{1000}{s} \quad , \quad q = \frac{3600}{h}$$

$$FFS = BFFS - f_{LW} - f_{LC} - f_N - f$$

$$f_{HV} = \frac{1}{1 + P_T(E_T - 1)}$$

$$v_P = \frac{V}{PHF \times N \times f_{HV} \times f_P}$$

$$D = \frac{v_P}{S}$$

$$90 \leq FFS \leq 120 \text{ and } V_P \leq (3100 - 15FFS)$$

$$I = R + a \quad , \quad L = \sum(I - a) + \sum l$$

$$C_o = \frac{1.5L + 5}{1 - Y}$$

$$g_n = \frac{y_n}{Y} (C_o - L)$$

$$G_n = g_n + l + R$$

$$k_n = G_n - a - R$$

