UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	ADVANCED TRAFFIC ENGINEERING
COURSE CODE	:	BFT 40503
PROGRAMME CODE	:	BFF
DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 Traffic is moving on a one way road at $q_A = 1000veh/hr$, and $K_A = 16veh/km$. A truck enters the stream at a point P (which is at a distance of 1 km from an upstream benchmark point BM) at a speed of $u_B = 16km/hr$. Due to the decreased speed the density behind the truck increases to $75veh/km$. After 10 minutes, the truck leaves the stream. The platoon behind the truck then releases itself at capacity conditions, $q_C = 1400v/hr$ and $k_C = 44v/km$.

(a) Determine the speed of all shockwaves generated

(5 marks)

(b) Explain the starting point of the platoon (behind the truck) forming the shockwave

(3 marks)

(c) Explain the starting point of the platoon dissipating shockwave

(3 marks)

(d) Explain the ending points of the platoon dissipating shockwaves

(5 marks)

(e) Determine the maximum length of the platoon

(5 marks)

(f) Explain the time it takes for the platoon to dissipate

(4 marks)

Q2 (a) Explain the objective of road hierarchy.

(4 marks)

(b) Classify and explain the urban route road hierarchy that exist in Malaysia, in term of their access control, mobility, and traffic condition.

(12 marks)

(c) Your house is quite closer to the heavy traffic road. A past year record shows that most of accident occurred in your areas is related to speeding. In your opinion discuss how can traffic calming reduce the problem? Give **THREE (3)** reasons.

(9 marks)

Q3 (a) A minor road carrying 150 veh/hr for 8 hour of an average day crosses a major road carrying 320 veh/h for the same 8 hour, forming a four-leg intersection. Determine whether a multiway stop sign is justified at this location if the following conditions exist:

The pedestrian volume from the minor street for the same 8 hour as the traffic volumes is 70 ped/hr.

The average delay to minor-street vehicular traffic during the maximum hours is 37 sec per vehicle.

The 85th percentile approach speed of the major road is 69km/hr (43 m/hr)

(8 marks)

(b) **Figure Q3(b)** shows hourly demand flows (pcu/hr) on the approaches of a T-intersection. Using the Webster method, design suitable signal timing.

Saturation flows (pcu/hr) and pedestrian volumes are given as in **Table 3**:

The following data will be used:

i. All red interval = 2.0 sec
ii. Yellow interval per phase = 3.0 sec
iii. Lost time per phase = 3.5 sec
iv. Average speed of pedestrians = 1.2 m/s
v. Effective pedestrian crosswalk width = 2.3 m
vi. Pedestrian crosswalk length = 13.0 m

(17 marks)

Q4 (a) To encourage non-motorised travel among people in urban areas, one of the element should be provided is pedestrian facilities. Write **FIVE (5)** factors must be considered in designing pedestrian facilities.

(10 marks)

(b) Explain comprehensively how non-motorised travel such a walking and cycling can improve road safety in Parit Raja.

(15 marks)

- END OF QUESTIONS -

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TABLE 3(b)

Approach	West		East		North	
Lane	Left	Right	Left	Right	Left	Right
Saturation Flow	1875	1740	1890	1650	1645	1695
Number of Pedestrians Crossing	35		30		25	

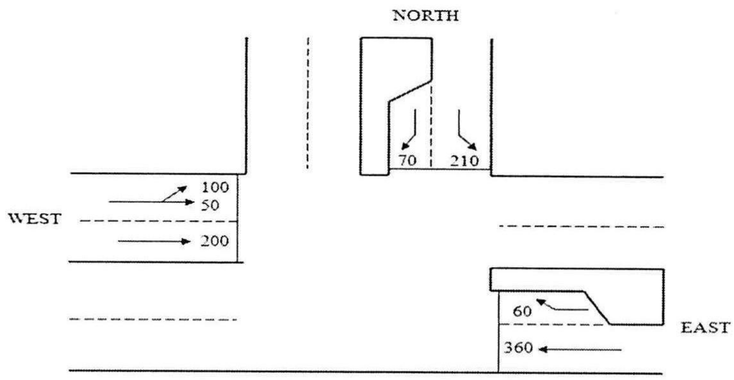

FIGURE Q3(b)

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The following equations may be useful to you:

$$DDHV = AADT \times K \times D, \quad D = \frac{5280 \times O}{L_v + L_d},$$

$$v = v_f - \frac{v_f}{k_j}k \qquad v = v_f e^{\left(\frac{-k}{k_j}\right)} \qquad v = C\ln\left(\frac{k_j}{k}\right) \qquad Y = a - bX \qquad a = \frac{\sum Y}{n} - b\frac{\sum X}{n}$$

$$b = \frac{n(\sum XY) - (\sum X)(\sum Y)}{n(\sum X^2) - (\sum X)^2} \qquad r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{\left(n(\sum X^2) - (\sum X)^2\right)\left(n(\sum Y^2) - (\sum Y)^2\right)}}$$

$$S_A = \frac{3600L}{T_R + d} \qquad d = d_1 * PF + d_2 + d_3 \qquad d_1 = \frac{0.5C\left(1 - \frac{g}{C}\right)^2}{1 - \left(\frac{g}{C}\right)min(X, 1.0)}$$

$$d_2 = 900T\left[(X-1) + \sqrt{(X-1)^2 + \frac{8kIX}{cT}}\right] \qquad I = 1.0 - 0.91X_u^{2.68} \qquad d_3 = \frac{1800Q_b(1+u)t}{cT}$$

$$t = 0 \text{ if } Q_b = 0, \quad else \quad t = min\left(T, \frac{Q_b}{c[1 - min(1, X)]}\right)$$

$$u = 0 \text{ if } t < T, \quad else \quad u = 1 - \frac{cT}{Q_b[1 - min(1, X)]} \qquad v_w = \frac{q_2 - q_1}{k_2 - k_1} \qquad X = \frac{v}{c}$$

$$c = s \times N \times \left(\frac{g}{C}\right) \qquad \tau_{\min} = \delta + \frac{W + L}{v_o} + \frac{v_o}{2a} \qquad C_o = \frac{1.5L + 5}{1 - Y}$$

$$L = \sum l + R \qquad G_e = \frac{y}{Y}(C - L) \qquad G_a = G_e + l - \tau \qquad \tau_{\min} = t_{pr} + \frac{W + L}{v_o} + \frac{v_o}{2a}$$

$$\text{If } W_E > 3, \quad G_p = 3.2 + \frac{L}{S_p} + \left(2.7\frac{N_{ped}}{W_E}\right) \qquad \text{If } W_E \leq 3, \quad G_p = 3.2 + \frac{L}{S_p} + \left(0.27N_{ped}\right)$$

$$X_c = \sum\left(\frac{v}{s}\right)_c * \frac{C}{C - L} \qquad t_c = t_1 + \frac{(t_2 - t_1)(p - q)}{(r - s) + (p - q)} \qquad \lambda = \frac{V}{T} \qquad \mu = \lambda t$$

$$P(h > t) = e^{-\lambda t} \qquad P(h < t) = 1 - e^{-\lambda t}$$