Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	URBAN STORM WATER MANAGEMENT
COURSE CODE	:	BFW40503
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

ANSWER **ALL** QUESTIONS

Q1 (a) Explain **TWO (2)** hydraulic structures that are normally used in managing stormwater.
(2 marks)

(b) Identify **TWO (2)** impacts of urbanization on the water cycle.
(4 marks)

(c) UTHM management plans to create a water body in the area of DTMI. Based on your opinion, examine **TWO (2)** advantages and **TWO (2)** disadvantages of this proposal.
(8 marks)

(d) Based on proposal in question **Q1 (c)**, propose suitable facilities at this area with the aid of suitable diagram.
(6 marks)

(e) Suggest **TWO (2)** best methods that can be applied to reduce the dissolved pollutants.
(6 marks)

Q2 (a) There are several methods that can be used to compute peak flow. Briefly explain **TWO (2)** considerations for Time Area Method selection in determine peak flow.
(4 marks)

(b) Compare **THREE (3)** functional differences between detention and retention ponds from engineering purposes.
(6 marks)

(c) Based on the data given in **Table 1**, construct the temporal pattern.
(8 marks)

(d) **Figure Q2** shows the new proposed area for UTHM campus. Compute the peak discharge using Time area method by using the data in **Table 2** & **Table 3**.
(8 marks)

Q3 (a) "*Vegetative practices are usually employed in conjunction with other BMPs , since the vegetative practices alone do not have the capability of entirely controlling the increased runoff and pollutant export from a site*". Briefly appraise this statement regarding the stormwater management practices and its application.

(6 marks)

(b) A sand filter BMP will be designed to treat the first 0.0127 m of runoff per impervious m^2 from a 60,702.85 m^2 commercial site, which is 85 % impervious. Propose the dimensions of the sand bed using K = 1.07 m/day, Td = 40 hr = 1.67 days, and Z = 0.46 m. The designed sedimentation basin has to release the water quality volume over a 24 hr period

(8 marks)

(c) Infiltration facility is one of the BMPs usually constructed to control stormwater. With the aid of sketch, invent your infiltration facilities system to improve the conventional infiltration system.

(6 marks)

(d) New road is under construction and new design is needed due to changes of on-site requirement. Recommend **TWO (2)** design considerations that need to be considered for street gutter and inlets structures.

(4 marks)

Q4 (a) Compose **TWO (2)** advantages and **TWO (2)** disadvantages of engineered channels from urban stormwater management practices.

(6 marks)

(b) A composite gutter section has the dimension of W = 0.5 m, = 0.08, = 0.02, and a = 0.05 m. The Manning roughness factor is n = 0.016. Estimate the discharge in the gutter at a spread, T = 2.0 m.

(6 marks)

(c) As an engineer, you are being assigned to monitor Erosion and Sediment Control Plan (ESCP) at site based on the eight principles of ESCP. Compose the works that you need to do during drainage control and runoff management phase.

(6 marks)

(d) Recommend **TWO (2)** actions on principles of Erosion and Sediment Control plan (ESCP) to handle the erosion problems according to site conditions..

(6 marks)

– END OF QUESTIONS –

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TABLE 1

Storm duration = 25 minutes Number of Interval = 5			Rain (mm) at 5 minutes interval				
Date	**Total rain (mm)**	**Rank**	**1**	**2**	**3**	**4**	**5**
12.1.1990		7	9.3	10.3	9.7	9	8.3
7.12.1983		5	4.8	13.3	12	10.7	10.3
21.7.1992		4	11.2	17.3	9.3	4	10.5
3.12.1985		1	9.2	12.8	12.8	12.8	11.1
19.1.1999		9	8.1	8.9	9.9	6.9	7.1

TABLE 2

Catchment Condition	Initial Loss (mm)	Continuous Loss (mm/hr)
Impervious	1.5	0
Pervious	2.5	(i) Sandy soil: 20 mm/hr
		(ii) Loam soil: 10 mm/hr
		(iii) Clay soil: 3 mm/hr

TABLE 3

ID	Isochrones	Type of Soil	Coefficient, C	Total Rainfall (mm)
1	0 – 15	Clay soil	0.62	7.85
2	15 - 30	Clay soil	0.43	10.98
3	30 – 45	Clay soil	0.23	8.43
4	> 45	Loam soil	0.18	6.54

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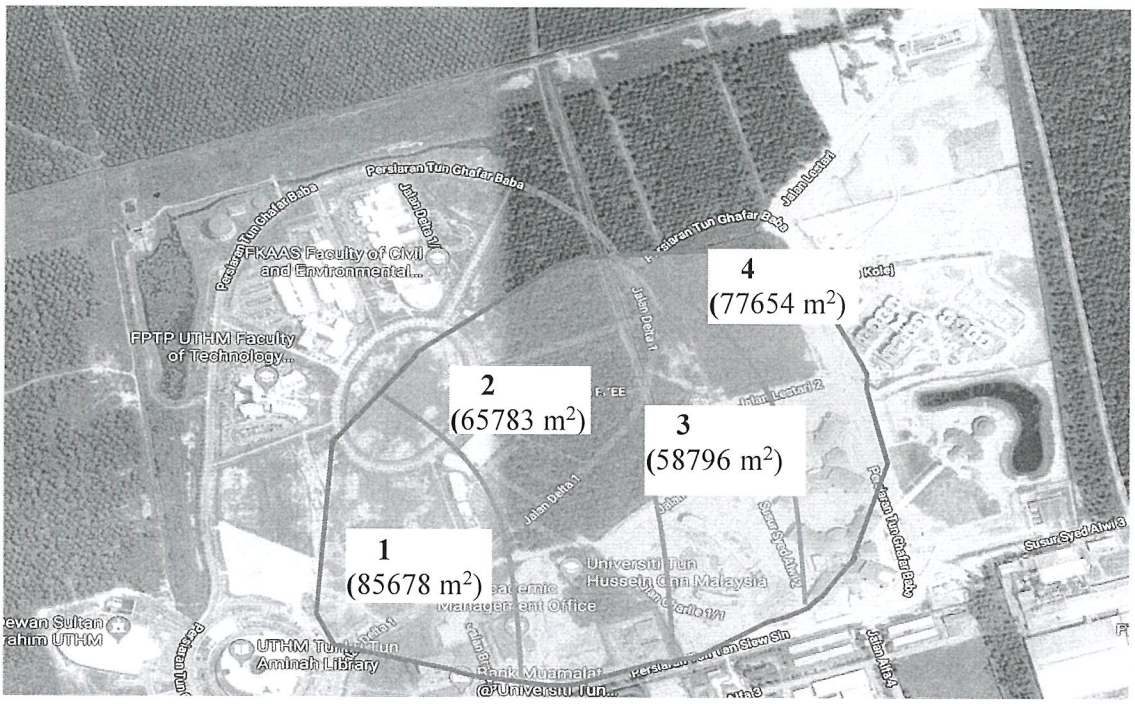

FIGURE Q2

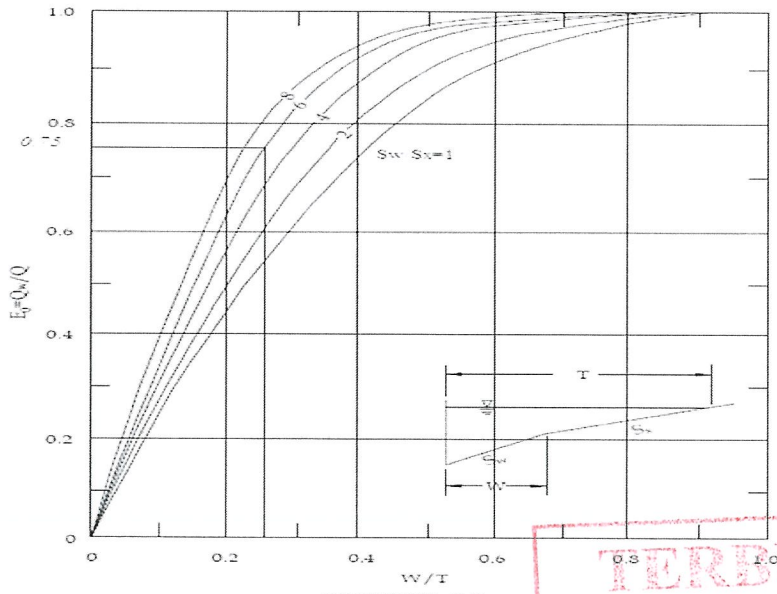

FIGURE Q2

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

$$P_{TM} = \frac{\sum P_j}{n} \qquad s = \sqrt{\frac{\sum (P_j - P_{TM})^2}{n-1}} \qquad I = \frac{P_T}{t_d}$$

$$i = \frac{\lambda T^{\kappa}}{(d+\theta)^{\eta}} \qquad Q = \frac{k_n T^{8/3} S_x^{5/3} S_L^{1/2}}{2.64n} \qquad \gamma = 89.6(VQ_p)^{0.56}(K.LS.C.P)$$

$$A = \frac{3.14d^2}{4} \qquad T = \left(\frac{Qn}{K_u S_x^{1.67} S_L^{0.5}}\right)^{0.375} \qquad d = TS_x \qquad L = \frac{R.EMC.A.C_v}{100}$$

$$T_s = T - W \qquad Q = \frac{Q_s}{1-E_o} \qquad S_x = \frac{S_{x1} S_{x2}}{S_{x1} + S_{x2}}$$

$$A_{sb} = \frac{S_Q Z}{K(h_{avg} + Z)T_d} \qquad S_Q = nLWd_t \qquad Q = CA(2gH)^{0.5}$$

$$t_o = \frac{107.n^*.L^{1/3}}{S^{1/5}} \qquad t_g = \frac{L}{40\sqrt{S}} \qquad t_d = \frac{n.L}{60R^{2/3}S^{1/2}}$$