UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2020/2021**

COURSE NAME	:	WATER RESOURCES ENGINEERING
COURSE CODE	:	MFA 10603
PROGRAMME CODE	:	MFA
EXAMINATION DATE	:	JULY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS **CLOSE BOOK EXAMINATION**

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) With aid of sketches, differentiate between highway, land and municipal drainages.

(6 marks)

(b) Drainage system in Kuala Kubu, Selangor catchment with a total area of 102.8 km^2 need to be upgraded. in with an. The catchment consists of 40% residential areas (C = 0.75), 30% industrial areas (C = 0.86), and 30% plantation estate and farms (C = 0.21). You are asked to estimate the peak flow rate for 5 and 50 years return period using modified rational method. Assume channel length is 10 km, average velocity is 4.5 m/s and average slope of 2%. Given $I_5 = 40 \frac{mm}{hr}$ and $I_{50} = 55 \frac{mm}{hr}$.

(9 marks)

(c) A new area in Kukup, Johor has been proposed to be developed next year. Suggest possible study or analyses that should be carried out to monitor and evaluate the changes in water supply and demand.

(10 marks)

Q2 (a) Discuss **THREE (3)** impacts of the occurrences of hydraulic transient in water distribution systems.

(6 marks)

(b) You are hired by a water company to propose a water distribution system at a new development residential area in Kajang, Selangor. In your proposal, attach schematic diagram of the system including all the components and their functions.

(8 marks)

(c) With your own words, elaborate on the concept and application of ecohydrology in managing watershed.

(11 marks)

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Q3   (a)   The annual–maximum discharge between 1980 and 2010 show a mean of 7.21 m^3/s and a standard deviation of 6.84 m^3/s. Assuming that the annual-maximum flows fulfill Gumbel distribution. Evaluate 100-year annual-maximum flowrate of the catchment.

(6 marks)

       (b)   Dams require frequent monitoring to ensure the structure in good condition. As a qualified engineer, you are required to produce at least **FOUR (4)** proper standard operating procedure (SOP) that must be performed in monitoring the dam.

(8 marks)

       (c)   In order to develop measures for mitigating the impacts of droughts, you are required to classify the types of droughts and their consequences. Further, sketch **THREE (3)** drought characteristics using appropriate simulation of drought index.

(11 marks)

Q4   (a)   Water wastage and privatisation of the water sector are among the challenges in water governance. Comment these two issues at length.

(6 marks)

       (b)   A 200-ha catchment is estimated to have the following time-area relationship and rainfall distribution as given in **Table 1** and **Figure Q4(b)**. Estimate the runoff hydrograph using the time-area method. Use a factor of 0.0028 to convert ha.mm/h to m^3/s.

(11 marks)

       (c)   Your company has been assigned to propose a sluice gate design that will be built in a rectangular channel for controlling flow rates in Kota Tinggi. The maximum flow discharge that needs to be adhered is 5 m^3/s. The width of the rectangular channel is 4 m with normal depth, y_0 of 3 m. In the proposal, provide a sketch of the design with all the important values, equations and assumptions made.

(8 marks)

– **END OF QUESTIONS** –

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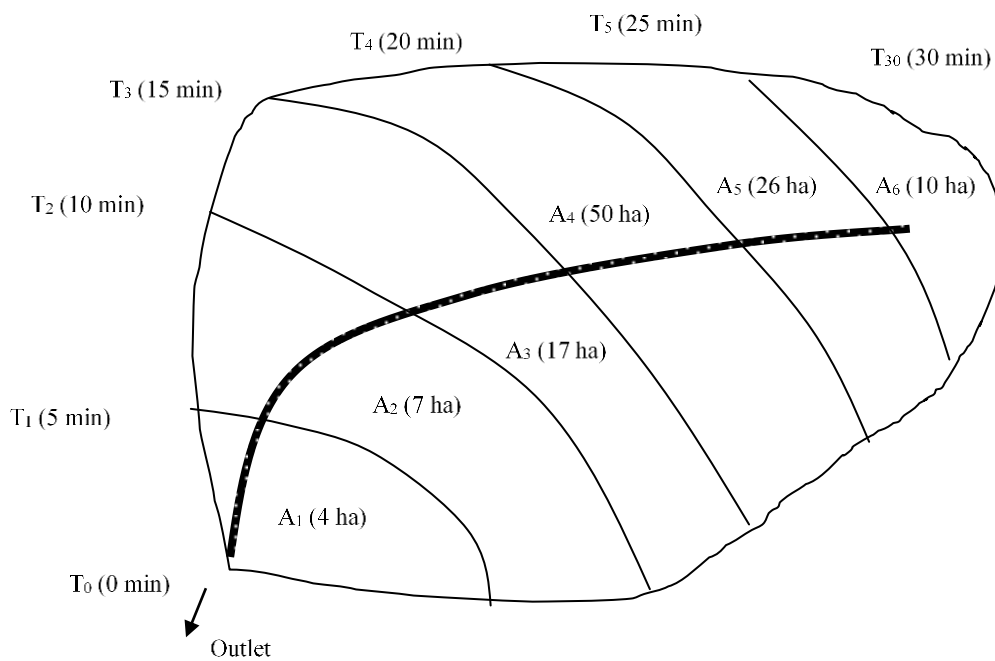SEMESTER/SESSION   : SEM II / 2020/2021   PROGRAMME CODE : MFA
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Table 1: Rainfall distribution

Time (min)	Rainfall Intensity (mm/h)
0-5	150
5-10	80
10-15	60
15-20	58
20-25	-
25-30	-

Figure Q4(b): Time-area relationship