UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER I
SESSION 2020/2021

COURSE NAME   : HYDROLOGY

COURSE CODE   : DAC 20502

PROGRAMME CODE   : DAA

EXAMINATION DATE   : JANUARY / FEBRUARY 2021

DURATION   : 2 HOURS 30 MINUTES

INSTRUCTION   : ANSWER **FIVE (5)** QUESTIONS
                         ONLY. **OPEN BOOK**
                         EXAMINATION

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THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

Q1 (a) Describe field of hydrology contributions which related to civil engineers.

(2 marks)

(b) Discuss water of the world from all locations.

(3 marks)

(c) Give **three (3)** components of surface water.

(3 marks)

(d) **Table 1** shows the reservoir data collected after a few days of observation. Calculate:

     (i) Total volume of inflow in 15 days (m^3).

(2 marks)

     (ii) Total volume of outflow in 15 days (m^3).

(2 marks)

     (iii) Total volume of infiltration (m^3).

(2 marks)

     (iv) Total volume of precipitation (m^3).

(2 marks)

     (v) Total volume of evaporation (m^3).

(2 marks)

     (vi) Change in storage in 15 days (m^3).

(2 marks)

Q2 (a) Define Double Mass Curve in providing consistent precipitation data.

(2 marks)

(b) Explain the Double Mass Curve procedures in solving inconsistent rain gauge data.

(6 marks)

(c) By referring to **Table 2**, calculate the adjusted precipitation (mm) from 2010 to 2013.

(4 marks)

(d) **Table 3** shows the readings collected by six rain gauge stations. Calculate:

     (i) Amount of missing precipitation data (mm) for station D.

(6 marks)

     (ii) Average precipitation depth (mm) in the basin.

(2 marks)

Q3 (a) Define the occurrence of evaporation as a main component in hydrologic cycle.

(2 marks)

(b) Describe **three (3)** meteorology factors affecting evaporation occurrence.

(6 marks)

(c) Table 4 shows the data for drainage area. Calculate:
    (i) Rate of runoff (in/month).

(2 marks)

    (ii) Rate of evaporation (m/month)

(2 marks)

(d) Mass Transfer Techniques is based on turbulent transfer of water vapour to the atmosphere. By referring to **Table 5,** use Meyer equations to calculate:

    (i) Vapour pressure (in Hg) for water temperature.

(2 marks)

    (ii) Vapour pressure (in Hg) for air temperature.

(2 marks)

    (iii) Rate of evaporation (in/day).

(2 marks)

(e) Ladino Clover crop mean's monthly consumptive use coefficient is 0.87, an average monthly temperature of 75 °F and an average value of daytime of 9.5%. Determine monthly consumptive (in).

(2 marks)

Q4 (a) Describe **two (2)** elements represented by hydrograph shape.

(2 marks)

(b) Explain **three (3)** types of terminology used in hydrograph shape.

(6 marks)

(c) Table 6 shows the precipitation data for Intensity Duration Frequency study.
    (i) Arrange precipitation values in descending order.

(1 mark)

    (ii) Calculate return period.

(1 mark)

    (iii) Interpolation for 10-year intensity duration frequency.

(4 marks)

(iv) Interpolation for 5-year intensity duration frequency.

(4 marks)

(v) Convert precipitation depth (in) to intensity value (in/hour) 5 min duration.

(2 marks)

Q5 (a) Define surface runoff which is flowing off due to precipitation occurrence.

(2 marks)

(b) Explain the paths of runoff after a rainfall occurrence.

(4 marks)

(c) Describe wire gauge as a gauge used to measure the water surface elevation.

(2 marks)

(d) A storm hydrograph is given in **Table 7** with the corresponding excess rainfall. The time interval is an hour between readings. Determine the unit hydrograph.

(12 marks)

Q6 (a) List **two (2)** assumptions that can be made for direct runoff hydrograph.

(2 marks)

(b) Describe procedures to determine unit hydrograph.

(6 marks)

(c) By referring to **Table 8**, determine the river flow (m^3/s) which contributed by baseflow.

(12 marks)

Q7 (a) Define specific yield as a groundwater parameter.

(2 marks)

(b) Explain Pulse Method which applied in reservoir routing.

(6 marks)

(c) By referring to **Table 9**, determine the values of peak flow (m^3/s) by using Snyder's Method.

(12 marks)

- END OF QUESTIONS –

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Table 1

Item	Value
Reservoir area	$1.59 \times 10^7 \, m^2$
Observation duration	0.5 month
Average inflow	$12.7 \, m^3/s$
Average outflow	$20833 \, m^3/hour$
Average infiltration	1.5 mm/15-day
Average precipitation	10.5 cm/15-day
Total evaporation	4.5 mm/15-day

Table 2

Item	Value
Original slope	0.19
Adjusted slope	0.25
Original Precipitation 2010	33.5 mm
Original Precipitation 2011	29.3 mm
Original Precipitation 2012	33.9 mm
Original Precipitation 2012	31.7 mm

Table 3

Station	Amounts of Precipitation (cm)	Normal Annual Precipitation (cm)
A	9	95.9
B	9.5	99.3
C	11.9	111.9
D	Missing	113.3
E	9.7	99.5
F	11.1	119.9

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Table 4

Item	Average Precipitation	Average Monthly Runoff	Drainage Area	Drainage Area
Value	93 mm/month	137 m³/s	1333100 ha	1.3×10^{10} m²

Table 5

Item	R_H	T_{water}	W_{speed}	T_{air}	$C_{panempirical}$
Value	17%	57 °F	9.5 mph	80 °F	0.35

Temperature (°F)	50	60	70	80	90
Vapour Pressure (in Hg)	0.36	0.52	0.74	1.03	1.42

Table 6

No.	Precipitation (in) of duration:			
	5 min	15 min	25 min	35 min
1	0.13	0.33	0.51	0.73
2	0.11	0.39	0.49	0.69
3	0.09	0.29	0.53	0.71
4	0.15	0.41	0.47	0.79
5	0.19	0.37	0.55	0.67
6	0.07	0.35	0.59	0.77
7	0.17	0.31	0.57	0.75
8	0.21	0.43	0.45	0.63
9	0.23	0.27	0.41	0.65
10	0.05	0.45	0.43	0.61

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Table 7

Time (hour)	Rainfall Excess (mm)	Direct Discharge (m³/s)
1	20	20
2	60	140
3	40	400
4		1150
5		4450
6		9700
7		9480
8		4360
9		1560
10		940
11		525
12		375
13		195

Table 8

Unit Hydrograph Ordinates and Baseflow			
Date	Time (hour)	UH Ordinates (m³/s.cm)	Baseflow (m³/s)
11/11	0100	0	7
11/11	0400	19	7
11/11	0700	31	7
11/11	1000	51	9
11/11	1300	75	9
11/11	1600	59	9
11/11	1900	39	9
11/11	2200	31	11
12/11	0100	19	11
12/11	0400	11	11
12/11	0700	0	13
Effective Rainfall Hyetograph Ordinates			
Time (hour)	3	6	9
Rainfall Excess (cm)	1.1	1.9	3.1

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Table 9

Item	Value
Length of main stream from outlet	15 km
Length along main stream from outlet to catchment's centroid	5 km
Desired duration of effective rainfall	2 hour
Area of catchment	73 km^2
Peak coefficient	0.59
Time coefficient	1.5

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