Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	HYDROLOGY
COURSE CODE	:	DAC 20502
PROGRAMME CODE	:	DAA
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

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

Q1 (a) Define hydrologic cycle as a continous movement of water which located above and below the earth surface.

(2 marks)

(b) Give **six (6)** parameters of hydrologic data.

(6 marks)

(c) Data observation of 10 hectares reservoir has 1500 liter/s of average inflow, 730 liter/s of average outflow and 150 mm/day of evaporation rate. Calculate:

(i) Area of reservoir (m^2).

(2 marks)

(ii) Rate of inflow (m^3/day).

(2 marks)

(iii) Rate of outflow (m^3/day).

(2 marks)

(iv) Rate of evaporation (m^3/day).

(2 marks)

(v) Volume of storage (m^3/day).

(2 marks)

(vi) Height of water (m/day) in the reservoir.

(2 marks)

Q2 (a) Define precipitation as a kind of weather condition.

(2 marks)

(b) Explain the following categories of precipitation occurrence:

(i) Convective precipitation.

(2 marks)

(ii) Orographic precipitation.

(2 marks)

(iii) Cyclonic precipitation.

(2 marks)

(c) Refer to **Table 1**, determine the rainfall depth (cm) at station A.

(12 marks)

Q3 (a) Define Mass Transfer Techniques as a method to estimate the evaporation rate.
(2 marks)

(b) Give **two (2)** methods to estimate the evaporation rate in Mass Transfer Techniques.
(2 marks)

(c) Describe the following factors affecting infiltration rate:

(i) Soil characteristics.
(2 marks)

(ii) Fluid characteristics.
(2 marks)

(d) Total storage of a pond is 181000 m^3 in a month and the average inflow is 0.07 m^3/s. Calculate the evaporation rate (m^3/month).
(4 marks)

(e) Refer to **Table 2**, the mean value for air temperature is 29 °C, average wind speed is 12.5 km/hr and relative humidity is 39%. Determine:

(i) Wind speed, U_2 (km/day).
(2 marks)

(ii) Saturation vapor pressure, e_a (mmHg).
(2 marks)

(iii) Actual vapor pressure in air, e_{aRh} (mmHg).
(2 marks)

(iv) Evaporation rate (cm/day) by using Dunne's equation.
(2 marks)

Q4 (a) Describe catchment area as a natural landscape in collecting water.
(2 marks)

(b) Explain Intensity Duration Frequency that commonly used for flood forecasting.
(6 marks)

(c) Refer to **Table 3**, time of concentration is the time required for runoff to travel in a catchment area. Calculate:

(i) Precipitation in descending value.

(3 marks)

(ii) Return period.

(3 marks)

(iii) Intensity Duration Frequency for 10-year.

(3 marks)

(iv) Intensity Duration Frequency for 5-year.

(3 marks)

Q5 (a) Describe surface runoff as a major component of the water cycle.

(2 marks)

(b) Give **two (2)** methods in derivation of Unit Hydrograph.

(2 marks)

(c) Explain the characteristics of staff in measuring water surface elevation.

(4 marks)

(d) Refer to **Table 4**, the time interval is an hour between readings for a storm hydrograph with the corresponding excess rainfall. Determine:

(i) Total number of DRO ordinates.

(2 marks)

(ii) Value of UH Ordinates ($m^3/s.mm$).

(10 marks)

Q6 (a) State **two (2)** types of substances that found in polluted groundwater.

(2 marks)

(b) Give **two (2)** assumptions for steady unconfined radial flow toward a well.

(2 marks)

(c) Explain groundwater replenishment which water is stored in the ground.

(4 marks)

(d) The mass of a sample is 100 g has displaced 51 cm^3 of water when the soil is poured into a graduated cylinder. The volume of the sample is 57 cm^3. Calculate:

(i) Soil density (kg/m^3).

(2 marks)

(ii) Soil specific gravity.

(2 marks)

(e) A soil sample occupies 0.06 m^3 has 100 kg of dry mass. When the soil is poured into a graduated cylinder, it displaces 30 liter of water. Determine:

(i) Volume of air void (m^3).

(2 marks)

(ii) Value of porosity.

(2 marks)

(iii) Soil bulk density ($sg_{soil} = 2.5$).

(2 marks)

(iv) Grain density.

(2 marks)

Q7 (a) Define Gumbel's method for flood estimation.

(2 marks)

(b) Explain applications of Gumbel's method in predicting the flood occurrence.

(6 marks)

(c) Refer to **Table 5**, the Gumbel extreme-value fit the recorded values. Calculate:

(i) Value of T_p (years).

(2 marks)

(ii) Value of y_t ($T = 5$).

(2 marks)

(iii) Value of σ_{n-1}.

(2 marks)

(d) Refer to **Table 6**, the travel time constant is 8 hours and weighting factor is 0.3. Determine the outflow.

(6 marks)

- END OF QUESTIONS –

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Table 1

Station	Precipitation, P (mm)	Coordinate X (km)	Coordinate Y (km)
A	P_A	0	0
B	550	2	5
C	510	5	7
D	590	1	-5
E	530	-3	-7
F	570	-1	3
G	550	-3	3
H	590	-5	5
J	715	-10	7

Table 2

Temperature (°C)	Vapor Pressure (mmHg)
25	23.76
30	31.83
35	42.18
40	55.34

Table 3

Year	Precipitation (cm) of Duration:		
	20 min	40 min	60 min
2009	33	55	79
2010	35	51	71
2011	31	59	71
2012	39	53	71
2013	37	57	75
2014	31	51	76
2015	38	51	74
2016	31	58	78
2017	34	56	73
2018	36	54	77

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Table 4

Time (hour)	Rainfall Excess (mm)	Direct Discharge (m^3/s)
1	15	15
2	25	100
3		290
4		560
5		670
6		325

Table 5

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Flood (m^3/s)	4761	2903	4900	3060	5826	2593	2652	2798	3050	4599

Table 6

Time (hour)	6	12	18	24	30	36
Inflow (liter/s)	90	210	350	230	100	50

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EQUATIONS:

$\Delta S = I - O - E$

$L^2 = X^2 + Y^2$

$W = 1 / L^2$

$P_A = \Sigma (P \times W) / \Sigma W$

$E = (0.013 + 0.00016U_2) \times ea_{Rh} \times [(100 - Rh) / 100]$

$T = (n + 1) / m$