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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022**

COURSE NAME : HYDROLOGY
COURSE CODE : DAC 21502
PROGRAMME CODE : DAA
EXAMINATION DATE : JANUARY / FEBRUARY 2022
DURATION : 2 HOURS 30 MINUTES
INSTRUCTION : 1. ANSWER **FIVE (5)** QUESTIONS ONLY.
2. THIS FINAL EXAMINATION IS AN **ONLINE ASSESSMENT** AND CONDUCTED VIA **OPEN BOOK**.

THIS QUESTION PAPER CONSISTS OF **TEN (10)** PAGES



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- Q1** (a) List **two (2)** occurrences which increase the water level in a reservoir. (2 marks)
- (b) Explain the following:
- (i) Infiltration process. (2 marks)
 - (ii) Evaporation process. (2 marks)
 - (iii) Transpiration process. (2 marks)
- (c) By referring to **Table 1**, calculate the following:
- (i) Area of catchment (m^2). (2 marks)
 - (ii) Volume of precipitation (m^3). (2 marks)
 - (iii) Volume of evaporation (m^3). (2 marks)
 - (iv) Total of outflow in 15 days (m^3). (2 marks)
 - (v) Volume of seepage loss (m^3). (2 marks)
 - (vi) Total of inflow (m^3) in 15 days. (2 marks)
- Q2** (a) List **two (2)** methods to solve missing point of precipitation. (2 marks)
- (b) Explain the Thiessen Polygon Method in determining average precipitation. (6 marks)
- (c) By referring to **Table 2**, calculate the amount of precipitation (cm) for station P. (4 marks)

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- (d) By referring to **Table 3**, calculate the following:
- (i) Amount of rainfall (mm) in each interval time. (4 marks)
 - (ii) Rainfall intensity (mm/hr). (4 marks)
- Q3** (a) List **two (2)** locations of evaporation pan in estimating rate of evaporation. (2 marks)
- (b) Explain the Blanney-Criddle Method in determining rate of transpiration. (6 marks)
- (c) By referring to **Table 4**, calculate the following:
- (i) Actual vapour pressure (mmHg) if the air temperature is 310 °K and relative humidity is 0.39. (3 marks)
 - (ii) Evaporation rate (mm/day) if the wind speed is 3.5 mph. (3 marks)
 - (iii) Extraterrestrial radiation (mmH₂O/day) if the month is April at latitude 37° south. (2 marks)
 - (iv) Daily heat budget (mm/day) if the variable of B is 18.6 mmH₂O/day. (2 marks)
 - (v) Potential evapotranspiration (mm/day) by referring to **Figure Q3(c)**. (2 marks)
- Q4** (a) List **two (2)** types of conceptual model of catchment area. (2 marks)
- (b) Explain the factors affecting watershed as follows:
- (i) Land cover and use. (2 marks)
 - (ii) Watershed slope. (2 marks)
 - (iii) Watershed length. (2 marks)



- (c) By referring to **Table 5**, calculate the following:
- (i) Average velocity (m/s). (2 marks)
 - (ii) Cross-sectional area (m²). (3 marks)
 - (iii) Total discharge (m³/s). (3 marks)
- (d) By referring to **Table 6**, calculate the following:
- (i) Composite runoff coefficient. (2 marks)
 - (ii) Peak runoff (m³/s) if the rainfall intensity is 7 mm/hr. (2 marks)

- Q5** (a) List **two (2)** components of bubble gauge recorder. (2 marks)
- (b) Describe floats as an equipment to measure velocity of water in a stream. (6 marks)
- (c) By referring to **Table 7**, calculate the following:
- (i) Time from beginning to peak (hr). (2 marks)
 - (ii) Peak discharge (m³/hr). (2 marks)
 - (iii) Point of unit hydrograph ordinates. (2 marks)
- (d) By referring to **Table 8**, calculate the following:
- (i) Direct runoff (m³/s). (3 marks)
 - (ii) River flow (m³/s). (3 marks)

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- Q6** (a) List **two (2)** functions of hydrologic routing. (2 marks)
- (b) Describe the following:
- (i) Pulse Method. (3 marks)
- (ii) Hydrologic routing. (3 marks)
- (c) By referring to **Table 9**, calculate the outflow (m^3/s) from a river which weighting factor is 0.17 and travel time constant is 17 hours. (12 marks)
- Q7** (a) List **two (2)** characteristics of water table in unconfined aquifer. (2 marks)
- (b) Discuss the well of hydraulic in groundwater flow analysis. (6 marks)
- (c) By referring to **Table 10**, calculate the discharge from the well (m^3/min) in an unconfined aquifer. (6 marks)
- (d) By referring to **Table 11**, determine rainfall excess (cm) which the surface runoff is 37773 m^3 catchment area is 95 hectares. (6 marks)

- END OF QUESTIONS -



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Table 1

Item	Value
Catchment area	377.73 km ²
Total of precipitation in 15 days	355 mm
Total of evaporation in 15 days	4.53 inch
Average of outflow in 15 days	11.95 m ³ /s
Total of seepage loss in 15 days	3.9 cm
Storage change in 15 days	521267400 m ³

Table 2

Station	Precipitation in a Month (cm)	Normal Annual Precipitation (cm)
P	?	111.9
Q	11.31	131.31
R	9.71	119.59
S	8.5	99.79
T	9.01	109.71
U	10.71	125.77

Table 3

Time (min)	Cummulative Rainfall (mm)
0	0
15	2
30	5
45	9
60	14
75	20
90	29
105	39
120	55

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Table 4

Item	Cloud Ratio	Psychrometer Constant	Reflection Coefficient	Latitude
Value	59%	0.27	31%	50° north
Vapour Pressure Based On Temperature				
Temperature (°C)	30	35	40	50
Value of Vapour Pressure (mmHg)	31.83	42.18	55.34	92.56
Variables of B Based On Temperature				
Temperature (°K)	305	310	315	320
Variables of B (mmH ₂ O/day)	17.46	18.6	19.85	21.15
Values of Mean Monthly Extraterrestrial Radiation (mmH₂O evaporated/day)				
Latitude	January	February	March	April
South 10°	15.8	15.7	15.1	13.8
South 20°	16.8	16.0	14.6	12.5
South 30°	17.3	15.8	13.6	10.8
South 40°	17.3	15.2	12.2	8.8

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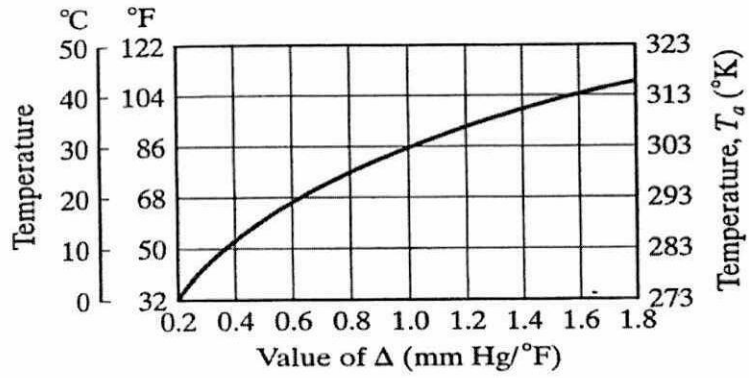


Figure Q3(c)

Table 5

Section No.	Depth (m)	Section Width (m)	Mean Velocity (m/s)
0	0	0	0
1	3.1	5.1	3.1
2	3.9	5.5	3.5
3	5.5	5.3	3.9
4	3.7	5.7	3.7
5	3.3	5.3	3.3
6	0	5.1	0

Table 6

Surface Type	Area (hectare)	Runoff Coefficient
Parks	5	0.15
Residential	31	0.35
Industrial	13	0.55
Apartment	7	0.7
Business Lot	19	0.75



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Table 7

Item	Value
Peak Coefficient	0.19
Basin Coefficient	1.5
Duration of Rainfall	5-hr
Length Along Main Stream From Outlet To Catchment's Centroid	15 km
Length of Main Stream	39 km
Basin Area	753 km ²
Time Ratio	0.5
Hydrograph Discharge Ratio	0.43

Table 8

Time (hr)	Effective Rainfall (mm)	Unit Hydrograph Ordinates (m ³ /s.mm)								Direct Runoff (m ³ /s)	Base Flow (m ³ /s)	River Flow (m ³ /s)
		1	19	11	0	0	0	0	0			
1300	13										5	
1500	31										7	
1700	39										3	
1900											0	
2100											0	
2300											0	
0100											0	
0300											0	

Table 9

Time (hr)	Inflow (m ³ /s)	C ₀ I ₂	C ₁ I ₁	C ₂ O ₁	Outflow (m ³ /s)
7	55	-	-	-	55
14	153				
21	351				
28	531				
35	135				
42	53				
49	15				

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Item	Value
Transmissivity	7531 m ² /day
Aquifer Thickness	0.057 km
Radial Distance From Observation Well 1 To Pumped Well	39 m
Drawdown At Observation Well 1	11 m
Radial Distance From Observation Well 2 To Pumped Well	75 m
Drawdown At Observation Well 2	9 m

Table 11

Time (hr)	Rainfall Intensity (cm/hr)
1	3
2	7
3	13
4	19
5	33
6	17
7	13
8	9
9	5