(14)

B.Sc. Engg. (CEE)/ 5th Sem.

06 October 2023
02:30 P.M to 04:00 P.M

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Mid-Semester Examination | **Winter Semester: 2022 - 2023**
Course No.: CEE 4563 | **Full Marks: 75**
Course Title: Engineering Hydrology | **Time: 1.5 Hours**

There are **3 (Three)** questions. Answer all **3 (Three)** questions. Programmable calculators are not allowed. Do not write on this question paper. The figures in the right margin indicate full marks and corresponding CO and PO. Symbols convey their usual meanings. Assume reasonable data/values for any missing data/info.

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1. **(a)** Write down the advantages and disadvantages of different arithmetic average method? What are the characteristics of DAD curves? **(CO1, PO1: 4)**

   (b) Explain how temperature and wind speed affect evaporation. **(CO1, PO1: 5)**

   (c) What is pan coefficient? What are the differences between interception and transpiration? **(CO1, PO1: 4)**

   (d) Explain why a perennial river can be both influent and effluent with figure. **(CO1, PO1: 4)**

   (e) What does engineering hydrology deal with? Write the major branches of hydrology. **(CO1, PO1: 3)**

2. **(a)** The coordinates of four precipitation gauging stations are A=(3,4), B=(9,4), C=(3,12), and D=(9,12). The observed precipitation amounts at these gauges are PA=25 mm, PB=33 mm, PC=20 mm, PD=29 mm, respectively. These stations are located in a rectangular basin whose boundaries are defined by the following coordinates (0,0), (14,0), (14,13), (0,13). If the units of the coordinate points given above are km, compute the mean areal precipitation over this basin in a **graph paper** using **(CO2, PO2: 8)**
   a) The Thiessen polygons method
   b) The arithmetic average method
   In addition, compute the total volume of water produced by the recorded rainfall.

   (b) The initial and the constant infiltration rates of a 201-hectare catchment are 6 cm/hr and 22 cm/hr, respectively. If the Horton's constant is 2 hr^{-1} then determine the infiltration volume after 75 minutes. **(CO2, PO2: 6)**

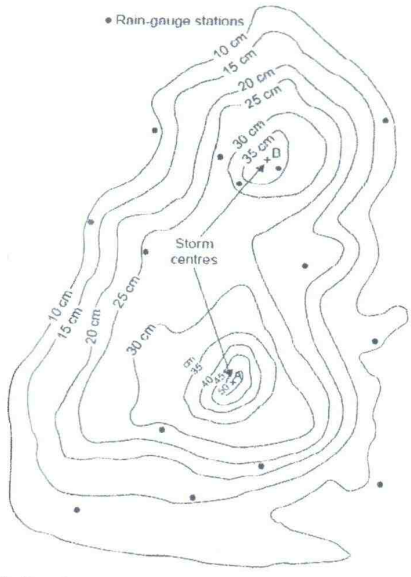
   (c) Compute the daily evaporation from a Class A pan if the amounts of water added to bring the level to the fixed point are as follows: **(CO2, PO2: 6)**

Day	1	2	3	4	5	6	7
Rainfall (mm)	14	6	12	8	0	5	6
Water added (mm): removed	-5	3	0	0	7	4	3

   What is the evaporation loss of water in this week from a lake (surface area = 640 ha) in the vicinity, assuming a pan coefficient of 0.75?

   (d) An isohyetal pattern of critical consecutive 4-day storm is shown in the figure. Prepare the DAD curve in a **graph paper.** **(CO2, PO2: 8)**

Isohyetal range (cm)	Area Enclosed (km^2) (1000)
>50	0.5
40-50	4
35-40	7
30-35	29
>35	2
30-35	9.5
25-30	82
20-25	122
15-20	156
10-15	236



(e) Explain the formation, types, and forms of precipitation with a proper figure. **(CO2, PO2: 7)**

3. (a) The stream discharges for various stages at a particular section were observed to be as follows. Obtain an equation for the stage-discharge relationship plotting in a **graph paper** and determine the discharge for a stage of 4.9 m and 12 m. **(CO3, PO3: 12)**

Stage (m)	1.81	1.81	2.00	2.90	3.70	4.50
Discharge (cumec)	1.00	1.50	2.55	5.60	11.70	20.20
Stage (m)	5.40	6.10	7.30	7.70	8.10	
Discharge (cumec)	32.50	44.50	70.0	80.0	90.0	

(b) The following data were collected for a stream at a gauging station. Compute the discharge with a proper diagram **(Landscape)** of the section. **(CO3, PO3: 8)**

Distance from one end of water surface (m)	Depth, d (m)	Immersion of current meter below water surface					
		At 0.6d		At 0.2d		At 0.8d	
		Rev.	Sec.	Rev.	Sec.	Rev.	Sec.
3	1.4	12	50				
6	3.3			38	52	23	55
9	5.0			40	58	30	54
12	9.0			48	60	34	58
15	5.4			34	52	30	50
18	3.8			35	52	30	54
21	1.8	18	50				

Rating equation of current meter: $v = 0.3\ N + 0.05$, N = rps, v = velocity, (m/sec), Rev.- Revolutions, Sec-time in seconds.