

Mid-West University
Examinations Management Office

End Semester Examinations 2081

Bachelor level/ B.E. Hydropower/ 4th Semester

Time: 3 hours

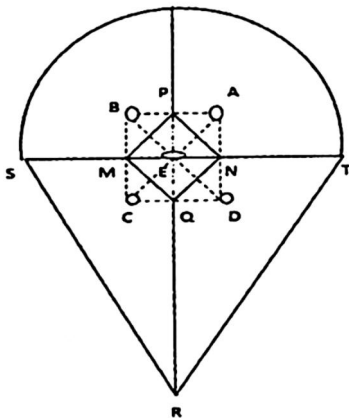
Subject: Engineering Hydrology (HE444/HE209)

Full Marks: 50

Pass Marks: 25

- Attempt all the questions
- Figures in the margin indicate full marks.
- Assume suitable values, with a stipulation, if necessary.
- Candidates are required to answer the questions in their own words as far as possible.

1. a) Explain hydrologic cycle with neat sketch. (3)
- b) The catchment area of a reservoir is 15km^2 . A uniform precipitation of 0.7cm/hr for 2hr was observed on a particular day. 40% of the runoff reached the reservoir. A canal carrying a flow of $1.5\text{m}^3/\text{sec}$ is taken from the reservoir. The rate of evaporation was 0.8mm/hr/m^2 . Assuming seepage loss to be 50% of evaporation loss, find the change in reservoir level for 7 hours in the next, if the water spread of the reservoir was 0.55km^2 . (3)
2. a) Explain the various methods for measurement of rainfall. (3)
- b) A semicircle of diameter of 50km with an equilateral triangle of side of 50km below its diameter is a close approximation to a river basin. The position co-ordinates of 5 rain gauge stations A, B, C, D and E located within the basin with respect to the co-ordinate axes system whose X axis and origin coincident with diameter and center of the circle are $(10, 10)$, $(-10, 10)$, $(-10, -10)$, $(10, -10)$ and $(0, 0)$ km respectively. If the rainfall recorded at these rain gauges are 85, 100, 81, 87, 112mm respectively, determine the average depth of rainfall using Thiessen polygon method. (5)



3. a) Write penman equation in detail. (3)
- b) A catchment of 30km^2 has one recording gauge. The data of mass curve of rainfall during a storm is given below.

Time (hr)	0	2	4	6	8	10	12	14
Cumulative rainfall (mm)	0	6	17	57	70	81	87	90

The volume of surface runoff measured is 1.3 million cubic meter. Compute depth of runoff and estimate phi-index. (5)

4. a) The ordinates of a 4 hour UH of a basin of area 25km^2 are given below.

t (hr)	0	4	8	12	16	20	24	28	32	36	40	44	48	52
UH(m^3/s)	0	40	65	100	140	180	190	170	120	70	45	30	18	0



5. a) Given the following data for a stream gauging operation in a river, compute discharge. (5)
- | Distance from left bank (m) | Depth (m) | Velocity (m/s) |
|-----------------------------|-----------|----------------|
| 0 | 1.5 | 0.2 |
| 5 | 2.5 | 0.5 |
| 10 | 3.5 | 0.8 |
| 15 | 4.5 | 1.2 |
| 20 | 5.5 | 1.5 |
| 25 | 6.5 | 1.8 |
| 30 | 7.5 | 2.0 |
| 35 | 8.5 | 2.2 |
| 40 | 9.5 | 2.5 |
| 45 | 10.5 | 2.8 |
| 50 | 11.5 | 3.0 |
| 55 | 12.5 | 3.2 |
| 60 | 13.5 | 3.5 |
| 65 | 14.5 | 3.8 |
| 70 | 15.5 | 4.0 |
| 75 | 16.5 | 4.2 |
| 80 | 17.5 | 4.5 |
| 85 | 18.5 | 4.8 |
| 90 | 19.5 | 5.0 |
| 95 | 20.5 | 5.2 |
| 100 | 21.5 | 5.5 |

Distance from left bank (m)	Depth (m)	Velocity (m/s)	
		At 0.6d	At 0.8d
0	-	-	-
1.5	1.4	0.7	0.5
3.0	2.7	0.9	0.7
4.5	1.8	0.8	0.5
6.0	1.0	0.6	0.4
7.5	0.4	0.4	0.3
9.0	-	-	-

6. a) For a river, the estimated flood peaks for two year return periods by the use of Gumbels methods are as follows;

Return period (years)	Peak flood (m ³ /sec)
100	650
50	590

What flood discharge in the river will have a return period of 1000 years? (5)

- b) Explain Dupit's theory and its assumptions for steady flow in to well. A 40cm diameter well penetrating an unconfined aquifer of 25cm thick below water table is pumped at a uniform rate of 700litr/min, till the water level in the well becomes steady. Two observation wells drilled radially at a distance of 20m and 80m from the center of the well, shows depression of 3.2m and 1.1m respectively.
- Determine the permeability of the aquifer.
 - Determine the drawdown at the main well. (6)

The End

Table 8-1 : Reduced mean \bar{Y}_n in Gumbel's Extreme Value Distribution

[illegible]

Table 8-2 : Reduced Standard Deviation S_n In Gumbel's Extreme Value Distribution

[illegible]