

KATHMANDU UNIVERSITY
End Semester Examination [C]
November/December, 2023

Marks Scored:

Level : B.E.

Course : CIEG 206

Year : II

Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date 05 DEC 2023

SECTION "A"

[20 Q. × 0.5 = 10 marks]

1. Encircle the most appropriate answer A hyetograph is a graphical representation of
 - a. Rainfall intensity and time
 - b. Rainfall depth and time
 - c. Discharge and time
 - d. Cumulative rainfall and time
2. A unit hydrograph has one unit of
 - a. Rainfall duration
 - b. Rainfall excess
 - c. Time base of direct runoff
 - d. Discharge
3. Rainfall simulators are used for the determination of
 - a. Evaporation
 - b. Precipitation
 - c. Runoff
 - d. Infiltration
4. The radius of influence is
 - a. Radius of the main well
 - b. Distance from the wall of main well to the point of zero draw down
 - c. Distance from the center of main well to the point of zero drawdown
 - d. Radius of observation well r_1 and r_2
5. The time required by rainwater to reach the outlet of drainage basin, is generally called
 - a. Time of concentration
 - b. Time of overland flow
 - c. Concentration time of overland flow
 - d. Duration of the rainfall
6. Which of the following is a non-recording rain gauge?
 - a. Tipping bucket type rain gauge
 - b. Symon's rain gauge
 - c. Steven's weighing type rain gauge
 - d. floating type rain gauge
7. Which of the following equation is used in hydrological flood routing?
 - a. Energy equation
 - b. Continuity equation
 - c. Equation of motion
 - d. Momentum equation
8. The area of land draining into a stream or a water course at a given location is known as
 - a. Built up area
 - b. Catchment area
 - c. Residential area
 - d. Plinth area
9. The stage in the river is defined as
 - a. The elevation of the water surface above an arbitrary datum
 - b. The average depth of flow in the stream
 - c. The hydraulic radius of stream cross section
 - d. The hydraulic depth of stream cross-section

10. ϕ -index is defined as
- the difference between maximum and minimum infiltration capacities
 - the maximum rate at which soil absorbs water
 - the average rainfall above which the rainfall volume equals to the runoff volumes
 - the minimum infiltration rate during the storm
11. Direct runoff is the sum of
- the surface runoff and the base flow
 - the base flow and the ground water runoff
 - the delayed subsurface runoff and the deep percolation
 - the surface runoff, prompt interflow and the precipitation on the channel surface
12. Land erosion forming small well defined incision in the land surface less than 30 cm in depth is
- Sheet erosion
 - Gully erosion
 - Rill erosion
 - Landslide
13. _____ travel with more or less with same velocity as water.
- Bed load
 - Total load
 - Bed load material
 - Suspended load
14. Pit sampling is carried out to estimate
- Wash load
 - Suspended load
 - Bed load
 - Reservoir sedimentation
15. Which one of the following is the correct statement about a rating curve
- The rating curve is used to convert records of flow rates into water levels
 - The records of water level into stage is done using salt dilution method
 - The rating curve method is the direct method of flow measurement
 - The rating curve is used to convert records of water level into flow rates
16. Which of the following instrument is not connected with river discharge measurement?
- Sounding weight
 - Current meter
 - Hygrometer
 - Wading rod
17. The following is not a direct stream flow determination technique
- Dilution method
 - Ultrasonic method
 - Area velocity method
 - Slope area method
18. To use Gumbel's method to estimate the magnitude of a flood with a return period of T years, the following data pertaining to annual flood series are sufficient:
- Mean and standard deviation
 - Mean, standard deviation and length of record
 - Standard deviation and length of record
 - Mean, standard deviation and coefficient of skew
19. A geological formation which is essentially impermeable for flow of water even though it may contain water in its pores is called
- Aquifer
 - Aquifuge
 - Aquitard
 - Aquiclude
20. A catchment is made of 45% area with runoff coefficient 0.4 and remaining 55% area with runoff coefficient 0.6. What is the weighted runoff coefficient to be used in rational formula?
- 0.6
 - 0.51
 - 0.45
 - 0.48

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Level : B.E.
Year : II
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Course : CIEG 206
Semester : II
F. M. : 40

SECTION "B"

Attempt ALL questions. Make suitable assumptions wherever needed

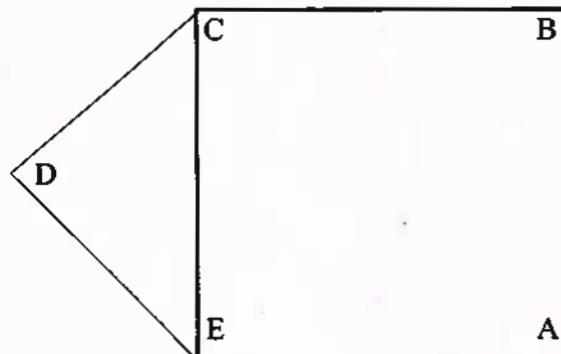
1. State water budget equation. Explain in brief hydrologic model classification. [1+3]
2. A small catchment of 600 hectares area received a rainfall of 12 cm in 90 minutes due to a storm. At the outlet of the catchment, the stream draining the catchment was dry before the storm and experienced a runoff lasting for 8 hours with an average discharge of 2.2 m³/s. The stream was again dry after the runoff event.
 - a. What is the amount of water which was not available to runoff due to combined effect of infiltration, evaporation and transpiration? [2]
 - b. What is the ratio of runoff to precipitation? [1]
3. Differentiate evaporation and evapotranspiration. Explain Penman's equation in brief. [2.5+2.5]

4. A catchment of 35 km² has one recording gauge. The data of mass curve of rainfall during a storm is given below.

Time (h)	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 ϕ -index. [5]

5. A catchment has an area in the form of pentagon with each side of length 20 km in the figure. The five rain gauges located at the corners A, B, C, D and E have recorded 60, 81, 73, 59, and 45mm of rainfall respectively. Compute average depth of rainfall over the catchment by Thiessen polygon and arithmetic mean method. [4+1]



6. Define flood routing. What are the methods of estimating flood? Explain various methods of mitigation of flood. [1+1.5+2.5]

7. Following are the ordinates of a storm hydrograph of a river draining a catchment area of 400 km² due to a 6-h isolated storm. Derive the ordinates of a 6-h unit hydrograph for the catchment. [5]

Time from start of storm (h)	-6	0	6	12	18	24	30	36	42
Discharge (m ³ /s)	10	10	30	87.5	115.5	102.5	85	71	59

48	54	60	66	72	78	84	90	96	102
47.5	39	31.5	26	21.5	17.5	15	12.5	12	10

8. A 20 cm diameter well completely penetrates a confined aquifer of permeability 40m/day. The length of the strainer is 18m. Under steady state of pumping the drawdown at the well was found to be 2.5m and the radius of influence was 250m. Calculate the discharge. [3]
9. Describe reservoir sedimentation with neat sketches. Explain various measures of sediment management. [2.5+2.5]