KATHMANDU UNIVERSITY
End Semester Examination
January/February 2024

Marks Scored:

Level : B.E.
Year : II

28 JAN 2024

Course : CIEG 206
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date :

SECTION "A"
[20Q. × 0.5 = 10 marks]

Encircle the most appropriate answer.

1. Double mass curve technique is used
   a. To prepare the rainfall hyetograph from the rainfall mass curve
   b. To prepare the rainfall mass curve from the rainfall hyetograph
   c. To check the consistency of record at a suspected rain gauge station
   d. In developing isohyetal maps

2. The rating curve of a stream gauging station gives the variation of discharge with
   a. The area of flow b. The stage c. The depth of flow d. The velocity of flow

3. The evaporation through plants and from the surrounding soil together is called
   a. Hydration b. Vaporization c. Transpiration d. Evapotranspiration

4. Infiltration capacity of the soil is defined as
   a. The depth of water absorbed by the soil during the storm
   b. The intensity of rainfall above which the rainfall volume equals the observed runoff volume
   c. The maximum rate at which the soil absorbs water
   d. The permeability of the soil in vertical direction

5. Which of the following formation does not contain any ground water
   a. Aquifer b. aquifuge c. aquitard d. aquiclude

6. 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

7. ..... model include scale model that represent system on a reduced scale
   a. Stochastic b. Deterministic c. Physical d. Abstract

8. The rainfall mass curve shows the variation of
   a. Accumulated rainfall Vs. time in chronological order
   b. Accumulated rainfall intensity Vs. time
   c. Precipitation intensity Vs. time in chronological order
   d. Rainfall depths for various equal duration plotted in decreasing order

9. The ratio of the radiation reflected back by a surface to the radiation received by it is called
   a. Radiation coefficient b. Absorption coefficient
   c. Bowen's ratio d. Albedo

10. 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. Hydraulic depth of stream cross-section

11. Symon's rain gauge is
    a. Tipping bucket gauge
    b. Weighing type gauge
    c. Float recording gauge
    d. Non- recording gauge

12. ..... travel with more or less with same velocity as water.
    a. Bed load b. Total load c. Bed load material d. Suspended load

13. The ratio of the volume of water retained by the formation when it freely drained to the volume of the formation is known as
    a. Specific yield b. Specific retention c. Specific storage d. Porosity

14. The base flow of a stream represents
    a. The ground water runoff and the prompt subsurface runoff
    b. The ground water runoff and the subsurface runoff
    c. The ground water runoff and the delayed subsurface runoff
    d. The runoff due to only show melt

15. The word unit in the unit hydrograph refers to the
    a. Unit depth of runoff
    b. Unit duration of the storm
    c. Unit base period of the hydrograph
    d. Unit area of the basin

16. The basic principles of unit hydrograph theory are
    a. Linearity and time invariance
    b. Non linearity and time invariance
    c. Nonlinear time variance and linearity
    d. Nonlinear time variance and non-linearity

17. The S-curve hydrograph is used
    a. To estimate the peak flood flow of a basin resulting from a given storm
    b. To develop synthetic unit hydrograph
    c. To convert the unit hydrograph of any given duration into a unit hydrograph of any other desired duration
    d. To derive the unit hydrograph from complex storms

18. The hydrologic routing methods are based on
    a. Continuity equation only
    b. Continuity equation and energy equation
    c. Continuity, momentum and energy equations
    d. Momentum equations only

19. A flood with a return period of 100 years is the flood which occurs
    a. Every 100^{th} year
    b. The maximum observed flood in the past 100 years
    c. Once in every 100 years on the average
    d. Only after 100 years in the immediate future

20. Removal of soil from rivulets by concentrated overland flow is known as
    a. Sheet erosion b. Channel erosion c. Rill erosion d. Gully erosion

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SECTION "B"

Attempt *ALL* questions. Make suitable assumptions when needed.

1. State water budget equation. Describe briefly various practical application of hydrology. [1+2]

2. The average annual rainfall in cm at 4 existing rain gauge stations in a basin are 105, 79, 70 and 66. If the average depth of rainfall over the basin is to be estimated with 10% error. Determine the additional number of gauges needed. [3]

3. The analysis of a storm yielded the following information regarding isohyets. Calculate the average depth of rainfall. [3]

Isohyet interval in (mm)	70-80	80-90	90-100	100-110	110-120	120-130
Area in (km^2)	10	85	113	98	136	67

4. Compute the discharge through a river with the following data. [5]

Distance from Right bank	Depth	Velocity	
		At 0.2d	At 0.8d
0	-	-	-
0.4	0.3	0.4	0.3
2.4	0.6	0.6	0.5
4.4	0.9	0.7	0.65
6.4	1.5	0.95	0.75
8.4	0.85	0.7	0.6
10.4	0.55	0.5	0.4
12.4	0.25	0.35	0.3
14.4	-	-	-

5. What is flow duration curve? How is it constructed? What are the uses of FDC? [5]

6. Given the following data about a catchment of area 800 km^2, determine the peak discharge corresponding to a storm of 6 cm in 1 hour. Assume base flow to be 150 m^3/s. [4]

Time	0	1	2	3	4	5
Rainfall (cm)	0	6	0	0	0	0
Runoff (m^3/s)	150	200	1200	500	250	150

7. Define flood routing. What are the uses of flood routing? Differentiate between hydraulic and hydrologic routing. [1+1+2]

8. Using 30 years data and Gumbel's method, the flood magnitude for return periods of 100 and 50 years for a river are found to be 700 m^3/s and 500 m^3/s respectively. [5]
   a. Determine the mean and standard deviation of the data used? Take values of reduced mean and reduced standard deviation in Gumbel's extreme value distribution for n = 30 as 0.536 and 1.112 respectively.
   b. Estimate the magnitude of flood with a return period of 200 years.

9. Pumping at a rate of 1500 lpm from a 30 cm diameter test well penetrating in to 60 m of an unconfined aquifer gives drawdown of 2.0 and 1.1m in observation wells located respectively at 120 and 160 m away from it. Calculate [1.5+1.5]
   a. Hydraulic conductivity of the aquifer
   b. Drawdown of the pumping well.

10. Explain the types of sediment load. Discuss the measures to mitigate the reservoir sedimentation. [2+3]