OPSC 2019
Odisha Public Service Commission

Civil Engineering
Objective Practice Sets

Engineering Hydrology

Contents

MADE EASY
Publications

1 Introduction

CHAPTER

Q.1 The percentage of earth covered by oceans is about
(a) 31%   (b) 51%
(c) 71%   (d) 97%

Q.2 The percentage of total quantity of water in the world that is saline is about
(a) 71%   (b) 33%
(c) 67%   (d) 97%

Q.3 The percentage of total quantity of fresh water in the world available in the liquid from is about
(a) 30%   (b) 70%
(c) 11%   (d) 51%

Q.4 If the average annual rainfall and evaporation over land masses and oceans of the earth are considered it would be found that
(a) over the land mass the annual evaporation is the same as the annual precipitation
(b) about 9% more water evaporates from the oceans than what falls back on them as precipitation
(c) over the ocean about 19% more rain falls than what is evaporated
(d) over the oceans about 19% more water evaporates than what falls back on them as precipitation

Q.5 In the hydrological cycle the average residence time of water in the global
(a) atmospheric moisture is larger than that in the global rivers
(b) oceans is smaller than that of the global groundwater
(c) rivers is larger than that of the global groundwater
(d) oceans is larger than that of the global groundwater

Q.6 A watershed has an area of 300 ha. Due to a 10 cm rainfall event over the watershed a stream flow is generated and at the outlet of the watershed it lasts for 10 hours. Assuming a runoff/rainfall ratio of 0.20 for this event, the average stream flow rate at the outlet in this period of 10 hours is
(a) $1.33 \, m^3/s$ (b) $16.7 \, m^3/s$
(c) $100 \, m^3/minute$ (d) $60000 \, m^3/h$

Q.7 Rainfall of intensity of 20 mm/h occurred over a watershed of area 100 ha for a duration of 6 h. measured direct runoff volume in the stream draining the watershed was found to be $30,000 \, m^3$. The precipitation not available to runoff in this case is
(a) 9 cm   (b) 3 cm
(c) 17.5 mm   (d) 5 mm

Q.8 A catchment of area $120 \, km^2$ has three distinct zones as below:

Zone	Area (km²)	Annual runoff (cm)
A	61	52
B	39	42
C	20	32

The annual runoff from the catchment, is
(a) 126.0 cm   (b) 42.0 cm
(c) 45.4 cm   (d) 47.3 cm

Q.9 Match **List-I** with **List-II** and select the correct answer using the codes given below the lists:

  List-I
A. Double mass curve technique
B. Hyetograph
C. Mass curve of a storm
D. Isopluvial map

List-II

1. Plot of accumulated precipitation against time in chronological order
2. Estimation of missing rainfall data
3. Checking the consistency of rainfall records
4. Plot of intensity of rainfall against time
5. Lines of equal depth of rainfall of given duration and frequency

Codes:

	A	B	C	D
(a)	4	1	3	5
(b)	4	2	1	5
(c)	3	4	1	5
(d)	3	5	4	2

Q.10 Match **List-I** (Plot of) with **List-II** (Name) and select the correct answer using the codes given below the lists:

List-I

A. Accumulated precipitation vs time in chronological order
B. Rainfall intensity vs time
C. Streamflow vs time in chronological order
D. Stream discharge vs percent time the flow is equaled or exceeded
E. Cumulative discharge vs. time in chronological order

List-II

1. Hydrograph
2. Hyetograph
3. Flow duration curve
4. Flow-mass curve
5. Mass curve of rainfall

Codes:

	A	B	C	D	E
(a)	2	5	1	4	3
(b)	5	2	1	4	3
(c)	5	2	1	3	4
(e)	5	2	4	3	1

Q.11 Which of the following pairs are correctly matched?

1. Isochrone - Travel time
2. Isonif - Snowfall amount
3. Isotherms - Atmospheric temperature
4. Isobath - Sunshine hours
5. Isohyet - Rainfall depth

Codes:

(a) 1, 2, 3 and 5 are correct
(b) 2, 3 and 5 are correct
(c) 1, 2, 4 and 5 are correct
(d) 1, 3 and 5 are correct

Q.12 The average annual rainfall over whole of India is estimated as

(a) 189 cm   (b) 319 cm
(c) 89 cm   (d) 119 cm

Q.13 If for a given basin in a given period, P = precipitation, E = evapotranspiration, R = total runoff and ΔS = increase in the storage of water in the basin, the hydrological water budget equation states

(a) $P = R - E \pm \Delta S$
(b) $R = P + E - \Delta S$
(c) $P = R + E \pm \Delta S$
(d) None of these

Q.14 When the density of snowfall is not known, it is usual to assume the water equivalent of snowfall as

(a) 10%   (b) 30%
(c) 50%   (d) 90%

Q.15 An isoniff is a line joining points having equal

(a) rainfall   (b) sunshine
(c) wind velocity   (d) snowfall

Q.16 Which area of India receives the least rainfall?

(a) Leh
(b) Eastern Rajasthan
(c) Gujarat
(d) Southern Tamil Nadu

Q.17 Under identical conditions, the evaporation from sea water is

(a) about 2-3% less than that from fresh water
(b) the same as that from fresh water
(c) about 2-3% more than that from fresh water
(d) 8-9% more than that from fresh water.

Q.18 The intensity of rainfall and time interval of a typical storm are

Time interval (minutes)	Intensity of rainfall (mm/minute)
0-10	0.7
10-20	1.1
20-30	2.2
30-40	1.5
40-50	1.2
50-60	1.3
60-70	0.9
70-80	0.4

The maximum intensity of rainfall for 20 minutes duration of the storm is
(a) 1.5 mm/minute   (b) 1.85 mm/minute
(c) 2.2 mm/minute   (d) 3.7 mm/minute

Q.19 Match **List-I** with **List-II** and select the correct answer using the codes given below the lists:

List-I
A. 26-50% decrease in seasonal precipitation from the normal
B. Marked depletion of surface water and groundwater
C. Soil moisture and rainfall deficiency with aridity (AI) anomaly 26 to 50%
D. More than 50% decrease in seasonal precipitation from the normal

List-II
1. Severe meteorological drought
2. Moderate-arid Agricultural drought
3. Hydrological drought
4. Moderate meteorological drought

Codes:

	A	B	C	D
(a)	4	3	2	1
(b)	4	3	1	2
(c)	3	4	2	1
(d)	3	1	4	2

Q.20 Compactness coefficient of a basin is defined as

(a) $\dfrac{p}{(\pi A)^{1/2}}$ (b) $\dfrac{2p}{3(\pi A)^{1/2}}$

(c) $\dfrac{p}{2(\pi A)^{1/2}}$ (d) $\dfrac{p}{(\pi A)^{3/2}}$

Q.21 The characteristics of the drainage net can be described by
1. order of streams
2. the length of tributaries
3. the stream density
4. drainage density
The correct answer is
(a) both 1 and 3   (b) both 1 and 4
(c) 1, 2 and 4   (d) 1, 2, 3 and 4

Q.22 Virgin flow is
(a) the flow in the river downstream of a gauging station
(b) the flow in the river upstream of a gauging station
(c) the flow unaffected by works of man
(d) the flow that would exist in the stream if there were no abstractions to the precipitation

Q.23 In India, a meteorological subdivision is considered to be affected by moderate drought if it receives a total seasonal rainfall which is
(a) less than 25% of normal value
(b) between 25% to 49% of normal value
(c) between 50% to 74% of normal value
(d) between 75% to 99% of normal value

Q.24 An area is classified as a drought prone area if the probability P of occurrence of a drought is
(a) $0.4 < P \leq 1.0$ (b) $0.2 \leq P \leq 0.40$
(c) $0.1 \leq P < 0.20$ (d) $0.0 < P < 0.20$

Q.25 The drainage density is the
(a) average length of the streams per unit drainage area within the basin
(b) stream discharge per unit drainage area
(c) annual runoff per unit drainage area
(d) number of streams per unit drainage area

Q.26 An ephemeral stream
(a) is one which always carries some flow
(b) is one which carries only snowmelt water
(c) is one which has limited contribution
(d) does not have any base flow contribution

Q.27 According to Indian Meteorological Department, a meteorological division is considered to be affected by drought, if it receives

(a) total annual rainfall less than 50% of the normal value

(b) total seasonal rainfall less than 75% of the normal value

(c) total seasonal rainfall less than 85% of the normal value

(d) if the seasonal rainfall deficiency is less than 20%

Q.28 According to Indian Meteorological Department, a year is considered a drought year in case the total area affected exceeds

(a) 20% of the total area of the country

(b) 50% of the total area of the country

(c) 75% of the total area of the country

(d) 10% of the total area of the country

Q.29 The double mass analysis is adopted to

(a) estimate the missing rain fall data

(b) obtain intensities of rainfall at various duration

(c) check the consistency of data

(d) obtain the amount of storage needed to maintain a demand pattern

Q.30 A reservoir has average water spread over 4 km^2. During two months period of study, surface inflow = 240 ha-m, surface outflow = 192 ha-m: rainfall = 28 cm; change in storage = (+)72 ha-m. By the hydrologic equation, the estimated reservoir losses are

(a) 160 ha-m   (b) 120 ha-m

(c) 88 ha-m   (d) 232 ha-m

Q.31 The hydrologic equation states that :

(a) Σ Inflow – Σ outflow = constant

(b) Sub-surface inflow = sub-surface outflow

(c) Inflow into the basin = outflow from the basin

(d) Inflow – outflow = change in storage

Q.32 IHP stands for

(a) International Hydrologic Programme

(b) International Hydrologic Publication

(c) International Hydrologic Periodicals

(d) Intensive Hydraulic Pressure

Q.33 The length of stream per unit area is known as

(a) overflow density

(b) drainage density

(c) stream frequency

(d) average density

Q.34 A rain gauge should preferably be fixed

(a) near a building

(b) under a tree

(c) in an open space

(d) in a closed space

Q.35 What is 'Hydrological Cycle'?

(a) Processes involved in the transfer of moisture from sea to land

(b) Processes involved in the transfer of moisture from sea back to sea again

(c) Processes involved in the transfer of water from snowmelt in mountains to sea

(d) Processes involved in the transfer of moisture from sea to land and back to sea again

Q.36 Hydrology deals with

(a) process of depletion of water resources of land

(b) process of natural science of water

(c) process of various water phases

(d) All of the above

■■■■

| Answers | Introduction |

1. (c)	2. (d)	3. (a)	4. (b)	5. (d)	6. (c)	7. (a)	8. (c)	9. (c)	10. (c)
11. (a)	12. (d)	13. (c)	14. (a)	15. (a)	16. (a)	17. (a)	18. (b)	19. (a)	20. (c)
21. (b)	22. (c)	23. (c)	24. (b)	25. (a)	26. (d)	27. (b)	28. (a)	29. (c)	30. (c)
31. (d)	32. (a)	33. (b)	34. (c)	35. (d)	36. (d)				

| Explanations | Introduction |

6. (c)

$$\Rightarrow \frac{0.2 \times 10 \text{ cm} \times 300 \times 10^4 \text{m}^2}{10 \text{ hours}} = 6000 \text{ m}^3/\text{hr}$$

$$= 100 \text{ m}^3/\text{minute}$$

7. (a)

Total precipitation
$$= 20 \times 6 = 120 \text{ mm} = 12 \text{ cm}$$

Total runoff
$$= \frac{30000}{100 \times 10^4} = 3 \times 10^{-2} \text{ m}$$
$$= 3 \text{ cm}$$

Precipitation not available to runoff
$$= 12 - 3 = 9 \text{ cm}$$

8. (c)

Annual runoff
$$= \frac{\Sigma PA}{\Sigma A}$$
$$= \frac{61 \times 52 + 39 \times 42 + 20 \times 32}{120}$$
$$= 45.42 \text{ cm}$$

11. (a)

Isonifs – Isopleths of snowfall depth
Isobath – Equal depth in sea
Isohyets – Rainfall depth
Isohels – sunshine hours.

12. (d)

The mean of the annual rainfalls over a period of 35 years is known as average annual rainfall.

18. (b)

Maximum intensity of rainfall
$$= (2.2 + 1.5)/2$$
$$= 1.85 \text{ mm/minute}$$

20. (c)

Shape of a drainage basin is generally expressed by 'form factor' and 'compactness coefficient'.

22. (c)

Runoff, representing the response of a catchment to precipitation reflects the integrated effects of a wide range of catchment climate characteristics. True runoff is therefore stream flow in the natural condition, i.e., without human intervention. Such a stream flow unaffected by works of man, such as structures for storage and diversion on a stream is called virgin flow.

26. (d)

An ephemeral stream is a stream or part of stream or part of a stream that flows as a result of precipitation and is above the ground water reservoir. Ephemeral streams are found at southwestern perennial stream headwaters.

29. (c)

Double mass curve is used to check the consistency of data.

30. (c)

Area $= 4 \text{ km}^2$
Surface inflow $= 240$ ha-m
Surface outflow $= 192$ ha-m
Rainfall $= 28 \text{ cm}$