Q1. Hydrology is the science which deals with
(a) Rain water
(b) River water
(c) Sea water
(d) Surface and ground water

Q2. Hydro science (Hydrology) cycle is denoted by equation
(a) $P = E + R$
(b) $P = E - R$
(c) $P = ER$
(d) $P = E/R$

Q3. Which term is appropriate for the branch of physical geography which deals with the origin, distribution of water on the earth surface?
(a) Hydrolysis
(b) Oxidation
(c) Hydropethia
(d) Hydrology

Q4. Available moisture may be defined as
(a) Difference in water content of the soil between field capacity and permanent wilting point
(b) Moisture content at permanent wilting point
(c) Maximum water holding capacity
(d) None of the above

Q5. The hydrologic equation states that
(a) Σ inflow = Σ outlfow
(b) Σ inflow – Σ outflow = constant
(c) subsurface inflow = Subsurface out flow
(d) Σ inflow – Σ Outflow = Change in storage

Q6. The moisture content of the soil, after free drainage has removed most of the gravity water, is called
(a) Available moisture
(b) Saturation capacity
(c) Field capacity
(d) Gravity water

Q7. The real characteristics of a rain storm are represented by a
(a) DAD curve
(b) Hyetograph
(c) Mass curve
(d) Double mass curve

Q8. Double mass curve technique is followed to
(a) check the consistency of rain gauge record
(b) find the average rainfall over a number of year
(c) find the number of rain gauge required
(d) estimate the missing precipitation values

Q9. Standard rain gauge adopted in India is :
(a) None of the above
(b) Tipping bucket type
(c) Weighing bucket type
(d) Natural syphon type

Q10. Evapo-transpiration of water by a crop means water consumed by
(a) Evaporation only
(b) Conveyance loss and evaporation
(c) Transpiration and conveyance loss
(d) Transpiration and evaporation

Q11. If allowable percentage error in the estimate of basic rainfall is 'E' and co-efficient of variation of rainfall is 'C_v', then optimum number of rain gauges is given by
(a) $\sqrt{\frac{C_v}{R}}$
(b) $\frac{C_v}{E}$
(c) $\left(\frac{C_v}{E}\right)^{\frac{3}{2}}$
(d) $\left(\frac{C_v}{E}\right)^{2}$

Q12. Meyer's formula is a empirical formula used to determine _____ .
(a) Transpiration
(b) Evaporation losses
(c) Infiltration capacities
(d) None of the above

Q13. Lysimeter is used for measuring
(a) Infiltration
(b) Evaporation
(c) Vapour pressure
(d) Evapo-transpiration

Q14. If pan evaporation is denoted E_p and actual evaporation by E, then
(a) $E_p > E$
(b) $E > E_p$
(c) E = E_p
(d) E $\gtrless E_p$

Q15. Which of the following types of rain-gauge is used for measuring rain in remote areas
(a) Tipping bucket type
(b) Weighing bucket type
(c) Floating type
(d) Simon's rain-gauge

Q16. Which of the following method is not a direct stream flow measurement technique
(a) Dilution method
(b) Ultrasonic method
(c) Area-velocity method
(d) Slope-area method

Q17. Evapotranspiration is confined to
(a) Day light hours only
(b) Night time only
(c) Fallow land surfaces only
(d) None of the above

Q18. Which of the following is not a form of precipitation?
(a) Snow
(b) Rain
(c) Hail
(d) Smog

Q19. Find the runoff if 5 hours storm had 5 cm. of rainfall and the resulting runoff was 2.5 cm and if the ϕ index remains at the same value the runoff due to 12 cm of rainfall in 15 hours.
(a) 4.5 cm
(b) 4.6 cm
(c) 4.7 cm
(d) 4.8 cm

Q20. What is the unit of runoff in M.K.S system?
(a) cubic metre/sec
(b) square metre
(c) cubic metre
(d) metre/sec

Q21. A rain gauge should preferable be fixed
(a) near the building
(b) under the tree
(c) in an open space
(d) in a closed space

Q22. _____ is the result from lifting of warm moisture laden air masses due to topographic barriers.
(a) Convective precipitation
(b) Orographic precipitation
(c) Cyclonic precipitation
(d) Hydrography precipitation

Q23. Precipitation includes
(a) Rain
(b) Snow
(c) Hail
(d) All of these

Q24. The volume of rainfall which produces equal run-off is called
(a) Point rainfall
(b) Effective rainfall
(c) Average rainfall
(d) None of the above

Q25. Humidity is measured by
(a) Hydrometer
(b) Hygrometer
(c) Hyctometer
(d) Anemometer

Q26. Which of the following is a non-recording raingauge?
(a) Symon's raingauge
(b) Tipping bucket type raingauge
(c) Weighing type raingauge
(d) Floating type raingauge

Q27. A rainfall with an intensity of 5 mm/hr is classified as
(a) Trace
(b) Light rain
(c) Moderate rain
(d) Heavy rain

Q28. Estimation of Peak flood discharge for a catchment measuring 180 sq. km is done using Dicken's formula with a coefficient C = 16. The Peak flood discharge would be:
(a) 493 m^3/s
(b) 1246 m^3/s
(c) 786 m^3/s
(d) 2160 m^3/s

Q29. According to Reyve's formula for estimating floods, the peak discharge is proportional to
(a) A
(b) $A^{\frac{2}{3}}$
(c) $A^{\frac{3}{4}}$
(d) $A^{\frac{1}{2}}$

Q30. Dicken's formula for high flood discharge is used for the catchments in
(a) Eastern India
(b) Western India
(c) Northern India
(d) Southern India

Q31. The probability that a T year flood occurs in any year is

(a) $\frac{1}{T}$

(b) $\left[\frac{1}{T}\right]^2$

(c) log $\left[\frac{1}{T}\right]$

(d) $\left[\frac{1}{T}\right]^3$

Q32. The probable maximum flood

(a) is less than standard project flood

(b) is more than standard project flood

(c) is same as design flood

(d) none of the above

Q33. Unit hydrograph method is usually adopted for estimating floods when the catch is

(a) less than 5000 km²

(b) more than 7500 km²

(c) more than 10,000 km²

(d) none of these

Q34. Unit Hydrograph Theory was enunciated by

(a) Merrill Bernard

(b) W.W. Horner

(c) Le-Roy K. Shermen

(d) Robert E-Horten

Q35. Dicken's formula for determining maximum flood (with usual notation), is

(a) $Q_p = CA^{\frac{3}{4}}$

(b) $Q_p = C_1A^{\frac{2}{3}}$

(c) $Q_p = C\sqrt{A}$

(d) $Q_p = 177C\sqrt{A}$

Q36. The plot between rainfall intensity and time is called

(a) Mass curve

(b) Hyetograph

(c) Isohyetal

(d) Hydrograph

Q37. Calculate the seepage velocity of water through a permeable soil under a hydraulic gradient of 1/40. Take coefficient of permeability K = 1.2 × 10^{-2} m/s
(a) 48 × 10^{-2} m/s
(b) 3 × 10^{-4} m/s
(c) 33.3 × 10^{-2} m/s
(d) 4.8 × 10^{-4} m/s

Q38. The unit hydrograph is the graphical relation between which of the following options?
(a) total rainfall and total runoff
(b) total rainfall and the direct runoff
(c) effective rainfall and the total runoff
(d) effective rainfall and the direct runoff

Q39. The shape of the recession limb of a hydrograph depends upon
(a) Basin characteristics only
(b) Storm characteristics only
(c) Both (a) and (b)
(d) None of the above

Q40. Instantaneous unit hydrograph is a hydrograph of
(i) unit duration
(ii) unit rainfall excess
(iii) infinitely small duration
(iv) infinitely small rainfall excess
(a) (i) and (ii)
(b) (i) and (iv)
(c) (ii) and (iii)
(d) (iii) and (iv)

Q41. Which of the following equations is used in hydrologic flood routing method?
(a) Lacey's equation
(b) Equation of motion
(c) Energy equation
(d) Continuity equation

Q42. In a linear reservoir :
(a) outflow rate varies linearly with storage
(b) volume varies with elevation

(c) storage varies linearly with time
(d) storage varies linearly with inflow rate

Q43. The field irrigation requirement is computed as
(a) Consumptive use + field application losses
(b) Net irrigation requirement + field application losses
(c) Net irrigation requirement + conveyance losses
(d) Consumptive use + conveyance losses

Q44. The state of the soil when plants fail to extract sufficient water for their requirement is……
(a) maximum saturated point
(b) permanent wilting point
(c) ultimate utilization point
(d) None of these

Q45. The field capacity of a soil is 25%, its permanent wilting point is 15% and specific dry unit weight is 1.5. if the depth of root zone of a crop is 80cm, the storage capacity of the soil is
(a) 8 cm
(b) 10 cm
(c) 12 cm
(d) 14 cm

Q46. If the irrigation efficiency is 80%, conveyance losses are 20% and the actual depth of watering is 16 cm, the depth of water required at the canal outlet is……..
(a) 10 cm
(b) 15 cm
(c) 20 cm
(d) 25 cm

Q47. One cumec – day is equal to
(a) 8.64 hectare metres
(b) 86.4 hectare metres
(c) 864 hectare metres
(d) 0.864 hectare metres

Q48. The quantity of sulphates (PPM) contained in good quality irrigation water is
(a) 0 – 192
(b) 195 – 480
(c) > 480
(d) All the above

Q49. The consumptive use coefficient for crop like wheat, barley, flax and other small grains is approximately:
(a) 0.6

(b) 0.66
(c) 0.9
(d) 1.1

Q50. Evapotranspiration in a crop filed surrounded by dry fallow land will be higher than that surrounded by vegetation due to: -
(a) Conduction of heat
(b) Oasis effect
(c) Clothes line effect
(d) Convection effect

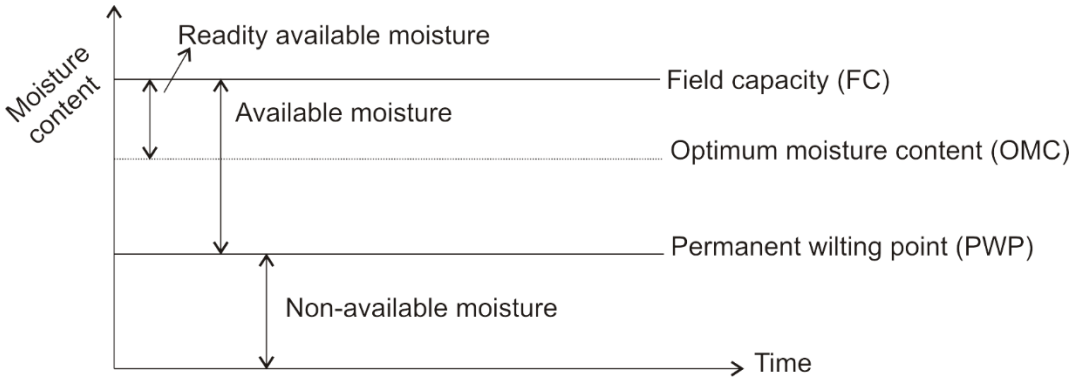
Solutions

S1. Ans.(d)
Sol. Hydrology is the science which deals with surface water and ground water.

S2. Ans.(a)
Sol. Hydrology cycle is movement of water from sea to land and land to sea. It the denoted by equation P=E+R
Where P= Precipitation
E= Evaporation
R = Runoff

S3. Ans.(d)
Sol. Hydrology is a branch of science which deals with circulation, distribution and movement of water on and below the earth surface and its atmosphere.

S4. Ans.(a)
Sol.



Available Moisture = Field capacity(FC)- Permanent wilting point(PWP)

S5. Ans.(d)

Sol. Hydrologic equation is given by-

$$\Sigma inflow - \Sigma outflow = Change\ in\ stroage$$

S6. Ans.(c)

Sol. The moisture content of the soil, after free drainage has removed most of the gravity water, is called field capacity.

S7. Ans.(a)

Sol. The real characteristics of a rain storm are represented by a DAD curve.

Depth Area duration (DAD) relationship-

$$\bar{P} = P_o e^{-kA^n}$$

$\bar{P} = Average\ depth\ in\ cm.$

P_o = Highest amount of rainfall in cm.

A= Area

K and n are constant for a given region.

S8. Ans.(a)

Sol. Double mass curve technique is followed to check the consistency of rain gauge record. It is used to correct the inconsistency of precipitation records.

S9. Ans.(d)

Sol. Natural syphon rain gauge is adopted in India. It is similar to weighing bucket rain gauge. It is recording type of rain gauge.

S10. Ans.(d)
Sol. Evapotranspiration is a combine process of evaporation and plant transpiration.
Evapotranspiration is measured by-

(i) Field plot
(ii) Lysimeter
(iii) Penman's equation
(iv) Blaney-criddle equation

S11. Ans.(d)
Sol. Optimum number of rain gauges is given by-

$$N = \left(\frac{C_v}{E}\right)^2$$

Where N = Number of rain gauges
C_v = co-efficient of variation
E= Allowable percentage error
$C_v$is calculated by $C_v = \frac{\sigma}{\text{Pavg}}$
Where $\sigma = \sqrt{\frac{\sum_{i=1}^{n}(pi-Pavg)^2}{n-1}}$
P_1, P_2 … = Precipitation at station 1,2 … etc.

$$\boxed{Pavg. = \frac{P_1 + P_2 + P_3 + - - - P_n}{n}}$$

S12. Ans.(b)
Sol. Meyer's formula is a empirical formula used to determine evaporation loss.
Meyer equation-

$$E = K(e_w - e_a)$$

Where
E= Rate of evaporation (mm/day)
K= constant
e_w= Saturation vapour pressure
e_a= Actual vapour pressure

S13. Ans.(d)
Sol. Lysimeter is used to measure evapo-transpiration.

S14. Ans.(a)

Sol. It pan evaporation is E_p and actual evaporation is E, then $E_p > E$

$Pan\ coefficient\ (C_p) = \frac{Lake\ evaporation}{Pan\ evaporation}$

S. no.	Pan	Pan co-efficent (C_p)
1.	Class-A	0.7
2.	Indian Standard	0.8
3.	Colorado Sunken	0.78

S15. Ans.(a)
Sol. Tipping bucket type of rain gauge is used for measuring rain in remote areas. It is recording type of rain gauge means produce continuous plot of rainfall against time.

S16. Ans.(d)
Sol. Slope area method is not a direct stream flow measurement technique. This method is used for high water marks and wash lines. Manning's equation is used in this method to calculate the discharge.

$Q = \frac{1}{n} AR^{2/3} S^{1/2}$

n= Meaning's co-efficient
R= Hydraulic mean radius
S= side slope
A= Area

S17. Ans.(a)
Sol. Evapotranspiration is confined to day light hour only.

S18. Ans.(d)
Sol. There are some forms of precipitation-

(i) Rainfall
(ii) Drizzle
(iii) Glaze
(iv) Snow
(v) Sleet
(vi) Hails

S19. Ans.(a)
Sol. Case- (i)

Duration of storm= 5 hours

Rainfall = 5 cm

Runoff = 2.5 cm.

P= Precipitation R= Runoff

$$\emptyset - index = \frac{P-R}{t} = \frac{5-2.5}{5} = 0.5\ cm/hr$$

Case- (ii)

Duration of storm = 15 hours

Rainfall = 12 cm

Runoff = ?

$$\emptyset - index\ is\ same$$

$$\emptyset - index = \frac{P-R}{t}$$

$0.5 = \frac{12-R}{15}$

R= 4.5 cm.

S20. Ans.(a)

Sol. The unit of runoff in M.K.S system is cubic-meter/ sec. or m^3/sec.

S21 Ans.(c)

Sol. Rain gauges is used to measure the rainfall. The rain gauge should preferable be fixed in an open area.

S22. Ans.(b)

Sol. Orographic precipitation is the result from lifting of warm moisture laden air masses due to topographic barriers like mountains.

S23. Ans.(d)

Sol. Refer the solution of question no. 10.

S24. Ans.(b)

Sol. The volume of excess rainfall which produces equal run-off is called effective rainfall.

S25. Ans.(b)

Sol. Hygrometer is used to measure humidity.

S26. Ans.(a)

Sol. Symon's rain gauge is a non-recording type of rain gauge while rest are recording type of rain gauges.

S27. Ans.(c)
Sol.

Intensity of Rainfall	Rain type
0-2.5 mm/Hr.	Light Rain
2.5-7.5 mm/Hr.	Moderate rain
>7.5 mm/Hr.	Heavy rain

S28. Ans.(c)
Sol. Peak flood discharge given by dicken formula-

$Q = CA^{3/4}$

Where Q= Peak flood discharge (m^3/sec)
C= Dicken's coefficient
A= Area in km^2
Now given C= 16, A= 180 km^2
Then Q= $16\ (180)^{3/4}$
Q= 786.27 m^3/sec

S29. Ans.(b)
Sol. Peak flood discharge by Reyve's formula-

$Q = CA^{2/3}$

A= area in km^2
Q= Peak flood discharge (m^3/sec)
C= constant
Reyve's formula is used for southern India catchments.

S30. Ans.(c)
Sol. Dicken's formula for high flood discharge is used for the catchments in northern India.

S31. Ans.(a)
Sol. The probability that a T year flood occurs in any year is, $p = \frac{1}{T}$
Reliability→ Probability that a particular value of peak flood discharge is never equal or exceed in design life of structure.
$Reliability = (1-p)^n$ where n= design life of structure

Risk→ Probability that a particular value of peak flood is equal or exceed at least once in design life of structure.

$Risk = 1 - (1 - p)^n$ where n= design life of structure.

S32. Ans.(b)

Sol. The probable maximum flood is more than the standard project flood.

Standard project flood= 40 to 60% of probable maximum flood.

S33. Ans.(a)

Sol. Unit hydrograph method is usually adopted for estimating floods when the catchment area less than 5000 km²

S34. Ans.(c)

Sol. A unit hydrograph is direct runoff hydrograph resulting from a runoff depth of 1cm or 1 inch or 1 mm etc. This theory is given by Le-Roy K.Sherman in 1932.

S35. Ans.(a)

Sol. Refer the solution of question no. 1

S36. Ans.(b)

Sol. Hyetograph is a plot between rainfall intensity with time.

S37. Ans.(b)

Sol. Given i= $\frac{1}{40}$, K= 1.2×10^{-2} m/sec.

Seepage velocity (v) = ki

= $\frac{1}{40} \times 1.2 \times 10^{-2}$

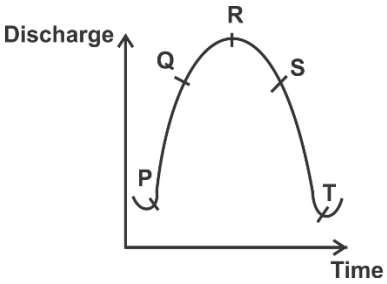
= $3 \times 10^{-4}\ m/sec$

S38. Ans.(d)

Sol. The unit hydrograph is the graphical relation between effective or excess rainfall and the direct runoff.

S39. Ans.(a)

Sol.



PQ= Rising limb → It depends on both catchment as well as rainfall characteristics.

QRS = Crest segment

ST= Falling or Recession limb → It depends only catchment characteristics.

S40. Ans.(c)

Sol. Instantaneous unit hydrograph is a hydrograph of unit rainfall excess for infinitely small duration.

$$u(t) = \frac{1}{i}\frac{ds}{dt}$$

i= rainfall intensity

S= ordinate of S-curve

u(t)= ordinate of instantaneous hydrograph.

Peak of instantaneous unit hydrograph is always greater than the peak of any other unit hydrograph.

S41. Ans.(d)

Sol. In hydrologic flood routing, continuity equation is used.

$$Q = A_1V_1 = A_2V_2$$

S42. Ans.(a)

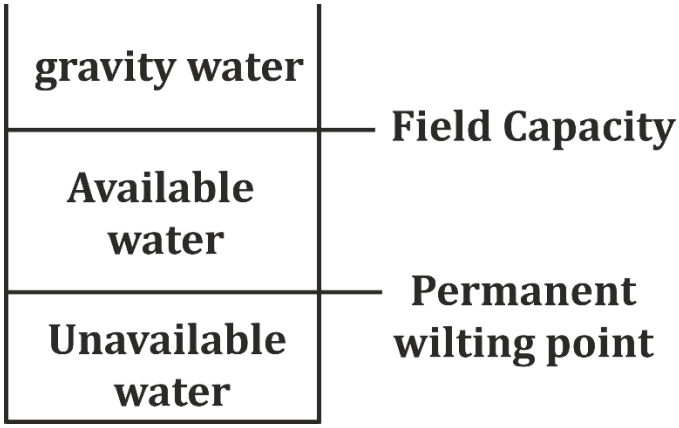
Sol. in a linear reservoir, outflow rate varies linearly with storage.

S43. Ans.(b)

Sol.Field Irrigation requirement (F.I.R.) = Net irrigation requirement + field applicable losses.

S44. Ans.(b)

Sol The state of the soil when plants fail to extract sufficient water for their requirement is permanent wilting point



→ below permanent wilting point no water is extract by the plant.

S45. Ans.(c)
Sol. Sol. Field Capacity (fc) = 25%
Permanent wilting point (ϕ) = 15%
Specific & dry unit weight (G) = 1.5
depth of root zone (d)= 80 cm.
Storage Capacity = $\frac{\gamma d(fc-\phi)}{\gamma_w}$

$= \frac{1.5\gamma\omega \times 80(0.25-0.15)}{\gamma_w}$

= 12 cm

S46. Ans.(d)
Sol. Irrigation efficiency =80%
Conveyance loss=20%
actual depth of watering = 16 cm
Assume depth of water = x cm.

$$\left(x \times \frac{80}{100}\right) - \left(x \times \frac{8}{100} \times \frac{20}{100}\right) = 16\ cm$$

$$\boxed{x = 25cm}$$

S47. Ans.(a)
Sol. 1 cumec-day

$= 1\ \frac{m^3}{sec} \times 24 \times 60 \times 60sec$

$= 24 \times 60 \times 60m^3$

$$\boxed{1\ hactare = 10^4 m^2}$$

$= \frac{24 \times 60 \times 60}{104}$

= 8.64 hactare metre

S48. Ans.(a)

Sol. For good quality irrigation water sulphate should be 0 to 192 PPM

S49. Ans.(c)

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S50. Ans.(b)