



CUET PG 2024 Soil Science Soil And Water Conservation Shift 2

Time Allowed :1 Hours 45 minutes

Maximum Marks :300

Total Questions :75

General Instructions

Read the following instructions very carefully and strictly follow them:

1. This question paper comprises 75 questions. All questions are compulsory.
2. Each question carries 04 (four) marks.
3. For each correct response, the candidate will get 04 (four) marks.
4. For each incorrect response, 01 (one) mark will be deducted from the total score.
5. Un-answered/un-attempted response will be given no marks.
6. To answer a question, the candidate needs to choose one option as the correct option.
7. However, after the process of challenges of the Answer Key, in case there are multiple correct options or a change in the key, only those candidates who have attempted it correctly as per the revised Final Answer Key will be awarded marks.
8. In case a question is dropped due to some technical error, full marks shall be given to all the candidates irrespective of the fact who have attempted it or not.

Question 1: If precipitation occurs as frozen water particles it is termed as

- (A) Rain
- (B) Drizzle
- (C) Hail
- (D) Vapour

Correct Answer: (C) Hail

Solution:

Hail forms when strong upward air currents in thunderstorms carry raindrops into extremely cold areas of the atmosphere, causing the drops to freeze. Hailstones grow as they are repeatedly lifted and accumulate layers of ice.

Quick Tip

Hail is always associated with thunderstorms and forms in layers of ice, differentiating it from other types of precipitation like rain or drizzle.

Question 2: In hydrologic frequency analysis, relationship between return period in years (T) and probability of occurrence in percent (P) in a given year is expressed by

- (A) $T = 100/P$
- (B) $T = P/100$
- (C) $T = P/365$
- (D) $T = 365/P$

Correct Answer: (A) $T = 100/P$

Solution:

The return period (T) is the reciprocal of the probability of occurrence (P). When expressed in percentage, $T = 100/P$. This relationship is fundamental in hydrology for predicting events like floods and storms.



Quick Tip

Higher the probability of occurrence, shorter the return period. For example, a 10% probability event has a return period of 10 years.

Question 3: DAD in DAD curves refers to

- (A) Days - Area - Duration
- (B) Depth - Area - Duration
- (C) Duration - Area - Days
- (D) Duration - Area - Depth

Correct Answer: (B) Depth - Area - Duration

Solution:

DAD curves are used in hydrology to represent the Depth-Area-Duration relationship of precipitation. These curves are helpful in assessing the distribution and intensity of rainfall over a specific area during a storm.

Quick Tip

Remember: DAD stands for Depth - Area - Duration and is a key concept in storm analysis and hydrological modeling.

Question 4: Erosion in numerous small channels that can be easily obliterated with normal tillage is known as

- (A) Gully erosion
- (B) Stream channel erosion
- (C) Mass erosion
- (D) Rill erosion

Correct Answer: (D) Rill erosion

Solution:



Rill erosion occurs when water runoff forms small, shallow channels on the surface of the soil. These channels are typically small enough to be removed by normal farming tillage methods, unlike gullies, which are larger and more permanent.

Quick Tip

Rill erosion is distinguished by its shallow channels, which can be fixed through regular tillage, unlike gully erosion.

Question 5: A gully is said to be of medium size if it has the following characteristics:

- (A) Width > 18 m; Depth 9 to 12 m; side slope 8–15%
- (B) Width < 18 m; Depth 9 to 12 m; side slope 5–7%
- (C) Width < 18 m; Depth 3 to 9 m; side slope 8–15%
- (D) Width > 18 m; Depth 3 to 9 m; side slope 5–7%

Correct Answer: (C) Width < 18 m; Depth 3 to 9 m; side slope 8–15%

Solution:

A medium-sized gully is defined based on specific dimensions and slope characteristics. The correct parameters include a width of less than 18 meters, depth between 3 to 9 meters, and side slopes of 8–15%.

Quick Tip

Gully classification is based on size: Medium gullies have moderate depth (3–9 m) and steeper slopes (8–15%).

Question 6: I_{30} in the calculation of Erosion Index at 30-minute intensity refers to

- (A) Minimum 30-minute rainfall intensity of the storm
- (B) Maximum 30-minute rainfall intensity of the storm
- (C) Arbitrary selection of a slot of 30-minute rainfall intensity of the storm
- (D) The first 30-minute rainfall intensity of the storm



Correct Answer: (B) Maximum 30-minute rainfall intensity of the storm

Solution:

I_{30} is a standard measure used in the Universal Soil Loss Equation (USLE). It represents the maximum rainfall intensity over a continuous 30-minute period during a storm, which significantly influences soil erosion rates.

Quick Tip

I_{30} helps quantify rainfall intensity and its impact on soil erosion, critical for erosion control measures.

Question 7: Soil erosion by water usually occurs in the sequence:

- (A) Sheet
- (B) Splash
- (C) Gully
- (D) Rill

Choose the correct answer from the options given below:

- (A) (A), (B), (C), (D)
- (B) (A), (B), (D), (C)
- (C) (B), (A), (D), (C)
- (D) (C), (B), (D), (A)

Correct Answer: (C) (B), (A), (D), (C)

Solution:

The process of soil erosion by water begins with sheet erosion, where thin layers of soil are removed. It is followed by splash erosion (impact of raindrops), rill erosion (small channels), and finally gully erosion (larger channels).



Quick Tip

Remember: Soil erosion progresses from sheet to splash, then to rill and gully erosion as the intensity increases.

Question 8: Flour pellet method is used for measuring

- (A) Raindrop size
- (B) Raindrop shape
- (C) Raindrop mass
- (D) Raindrop velocity

Correct Answer: (A) Raindrop size

Solution:

The flour pellet method involves raindrops falling on flour paste, forming hardened pellets upon drying. The size of these pellets correlates with the size of raindrops, providing an effective way to measure raindrop size.

Quick Tip

The flour pellet method is a simple technique to estimate raindrop size based on hardened flour paste.

Question 9: Spacing of spur in erosion control is determined by $N = L/S + 1$, where:

(Choose based on only those with correct description)

- (A) N = Number of spurs
- (B) L = Total length of eroded stream bank
- (C) S = Size of spurs
- (D) 1 = Effective length of 1 spur over stream bed

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only
- (B) (A), (B) and (C) only



(C) (A), (B), (C) and (D)

(D) (B), (C) and (D) only

Correct Answer: (A) (A), (B) and (D) only

Solution:

In erosion control, the number of spurs (N) is calculated using the total length of the eroded stream bank (L) divided by the effective size of spurs (S) plus one. This ensures proper spacing and effectiveness.

Quick Tip

Spur spacing is vital in erosion control, calculated as $N = L/S + 1$ for optimal coverage and efficiency.

Question 10: What are the different types of strip cropping?

(A) Contour strip cropping

(B) Field strip cropping

(C) Buffer strip cropping

(D) Wind strip cropping

Choose the correct answer from the options given below:

(A) (A), (B) and (C) only

(B) (A), (B) and (D) only

(C) (B), (C) and (D) only

(D) (A), (B), (C) and (D)

Correct Answer: (D) (A), (B), (C) and (D)

Solution:

All listed types of strip cropping are methods to control soil erosion and maintain soil fertility. Contour, field, buffer, and wind strip cropping are applied based on terrain, soil type, and wind direction.



Quick Tip

Strip cropping types include contour, field, buffer, and wind strip cropping, all aimed at minimizing erosion.

Question 11: Identify Cox's formula for Contour bunds (S is slope; X is Rainfall factor; Y is infiltration and crop cover factor):

- (A) $VI = 0.3 [S/3 + 2]$
- (B) $VI = [2 + S/3] 0.3$
- (C) $VI = (XS + Y) 0.3$
- (D) $VI = (XS + Y)/0.3$

Correct Answer: (C) $VI = (XS + Y) 0.3$

Solution:

Cox's formula combines slope, rainfall factor, and infiltration to calculate the volume index. The correct formula is $VI = (XS + Y) 0.3$, balancing these factors for effective contour bunding.

Quick Tip

Remember, Cox's formula integrates slope (S), rainfall (X), and infiltration (Y) to control soil erosion.

Question 12: What is the sequence of factors in a standard RUSLE equation?

- (A) Rainfall factor
- (B) Length and Slope factor
- (C) Soil cover/vegetation and Practices factor
- (D) Erodibility

Choose the correct answer from the options given below:

- (A) (A), (B), (C), (D)
- (B) (A), (D), (B), (C)



(C) (B), (A), (D), (C)

(D) (C), (B), (D), (A)

Correct Answer: (B) (A), (D), (B), (C)

Solution:

In the RUSLE equation, the factors are applied in the sequence: Rainfall (A), Erodibility (D), Length and Slope (B), and Soil cover/vegetation and practices (C). This order ensures precise estimation of soil loss.

Quick Tip

RUSLE factor sequence: Rainfall → Erodibility → Slope → Soil cover for accurate soil erosion prediction.

Question 13: Mulching helps to prevent soil erosion mainly by reducing:

(A) Splash impact and Overland flow

(B) Splash impact and Gully flow

(C) Splash impact and Streambank erosion control

(D) Overland flow and Gully flow

Correct Answer: (A) Splash impact and Overland flow

Solution:

Mulching covers the soil surface, reducing raindrop impact (splash erosion) and limiting surface water movement (overland flow). This helps prevent soil erosion and improves water retention.

Quick Tip

Mulching minimizes splash erosion and overland flow, enhancing soil conservation and water management.



Question 14: Which practices are agronomic measures of erosion control?

- (A) Strip cropping
- (B) Contour bunding
- (C) Mulching
- (D) Vegetative barriers

Choose the correct answer from the options given below:

- (A) (A), (B) and (C) only
- (B) (A), (B) and (D) only
- (C) (A), (C) and (D) only
- (D) (B), (C) and (D) only

Correct Answer: (C) (A), (C) and (D) only

Solution:

Agronomic measures such as strip cropping, mulching, and vegetative barriers help reduce soil erosion by protecting the soil surface and regulating water flow.

Quick Tip

Agronomic measures (strip cropping, mulching, and vegetative barriers) protect soil and prevent erosion effectively.

Question 15: Movement of soil grains in a series of jumps is referred to as:

- (A) Surface creep
- (B) Suspension
- (C) Saltation
- (D) Deposition

Correct Answer: (C) Saltation

Solution:

Saltation is the process of soil particle movement in short jumps or bounces due to wind or water forces, playing a key role in soil erosion.



Quick Tip

Saltation describes soil particles moving in short jumps due to wind or water forces, critical in erosion studies.

Question 16: The standard conditions considered in the Universal Soil Loss Equation:

- (A) Slope length - 22.6 m; Slope steepness - 9%; Land use - fallow with ploughing
- (B) Slope length - 22.6 m; Slope steepness - 3%; Land use - fallow with ploughing
- (C) Slope length - 22.6 m; Slope steepness - 9%; Land use - Cropped
- (D) Slope length - 22.6 m; Slope steepness - 3%; Land use - Cropped

Correct Answer: (A) Slope length - 22.6 m; Slope steepness - 9%; Land use - fallow with ploughing

Solution:

The Universal Soil Loss Equation (USLE) uses a slope length of 22.6 m and steepness of 9% on fallow land as standard conditions for soil loss calculation.

Quick Tip

USLE standard conditions simplify erosion prediction and ensure uniformity in soil loss calculations.

Question 17: You are planning to construct contour bunds in your field. On what degree of slope will you get good results?

- (A) 7-10 degree
- (B) 10-12 degree
- (C) 1-7 degree
- (D) 12-15 degree

Correct Answer: (C) 1-7 degree

Solution:



Contour bunding is most effective on gentle slopes ranging from 1-7 degrees. This range minimizes water runoff and maximizes soil conservation.

Quick Tip

Gentle slopes (1-7 degrees) are ideal for contour bunds, reducing runoff and improving water retention.

Question 18: In turbine pumps the flow from the impeller is:

- (A) Radial
- (B) Axial
- (C) No flow
- (D) Mixed flow

Correct Answer: (D) Mixed flow

Solution:

Turbine pumps use a mixed flow mechanism, combining both radial and axial flow patterns. This design enhances efficiency and versatility in water pumping applications.

Quick Tip

Mixed flow in turbine pumps increases efficiency by combining radial and axial flow dynamics.

Question 19: Pump laws for a centrifugal pump state that:

- (A) The head varies as the cube of the speed
- (B) The head varies as the square of the speed
- (C) The power varies as the cube of the speed
- (D) The power varies as the square of the speed

Choose the correct answer from the options given below:

- (A) (B) and (C) only



- (B) (A) and (C) only
- (C) (A) and (D) only
- (D) (B) and (D) only

Correct Answer: (A) (B) and (C) only

Solution:

Pump laws state that the head varies as the square of the speed, and the power varies as the cube of the speed. These relationships are fundamental for predicting centrifugal pump performance.

Quick Tip

$\text{Head} \propto \text{Speed}^2$, and $\text{Power} \propto \text{Speed}^3$: Key relationships in centrifugal pump performance.

Question 20: Centrifugal-type impellers are classified as:

- (A) Open and enclosed
- (B) Open, semi-enclosed and enclosed
- (C) Open and semi-enclosed
- (D) Semi-enclosed and enclosed

Correct Answer: (B) Open, semi-enclosed and enclosed

Solution:

Centrifugal impellers are categorized into open, semi-enclosed, and enclosed types based on the level of shrouding. Each type has specific applications depending on fluid properties and flow requirements.

Quick Tip

Open, semi-enclosed, and enclosed impellers are tailored for different applications, balancing design and efficiency.



Question 21: Head losses in pumps are caused by:

- (A) Friction and turbulence in the moving water
- (B) Shock losses resulting from sudden changes in momentum
- (C) Leakage past the impeller
- (D) Mechanical friction

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only
- (B) (A), (C) and (D) only
- (C) (A), (B), (C) and (D)
- (D) (B), (C) and (D) only

Correct Answer: (C) (A), (B), (C) and (D)

Solution:

Head losses in pumps occur due to a combination of friction, turbulence, sudden momentum changes, leakage, and mechanical friction. Understanding these factors helps in optimizing pump efficiency.

Quick Tip

Minimizing turbulence and maintaining proper seals can reduce head losses in pumps.

Question 22: Propeller pumps are designed principally for:

- (A) High heads and large capacities
- (B) High heads and low capacities
- (C) Low heads and low capacities
- (D) Low heads and large capacities

Correct Answer: (D) Low heads and large capacities

Solution:

Propeller pumps are suitable for applications requiring low heads and large capacities, such



as irrigation and flood control, due to their efficient water transfer capabilities.

Quick Tip

Propeller pumps are ideal for transferring large volumes of water over short vertical distances.

Question 23: We want to construct a bench terrace on a slope of 25%. If the vertical interval is 2 m, what is the width of terrace?

- (A) 80 m
- (B) 800 m
- (C) 8 m
- (D) 10 m

Correct Answer: (C) 8 m

Solution:

The width of a bench terrace is calculated as:

$$\text{Width} = \frac{\text{Vertical Interval}}{\text{Slope in Decimal Form}}$$

Given Vertical Interval = 2 m, Slope = 25% = 0.25:

$$\text{Width} = \frac{2}{0.25} = 8 \text{ m}$$

Quick Tip

To calculate terrace width: Divide vertical interval by the slope (in decimal form). For a 25% slope and a 2 m vertical interval, the width is 8 m.

Question 24: The cross-sectional area of a waterway is calculated using the formula _____, where a = area of cross-section, Q = expected maximum runoff and V = velocity of flow.

- (A) $a = (V/Q)$
- (B) $a = (Q/V)$



(C) $a = (Q/V) \times 100$

(D) $a = (V/Q) \times 100$

Correct Answer: (B) $a = (Q/V)$

Solution:

The cross-sectional area is calculated as:

$$a = \frac{Q}{V}$$

This formula ensures that the area accounts for the maximum runoff (Q) and flow velocity (V) for effective design.

Quick Tip

Use $a = \frac{Q}{V}$ for waterway cross-sectional area design, balancing flow and velocity.

Question 25: Match List I with List II:

List I	Agroforestry System	List II Characteristics/Constituents
A	Farm forestry	I. Fruit trees with fruit crops
B	Silvipastrol system	II. Trees with crops
C	Agri-silviculture system	III. Trees planted along the boundaries of agricultural fields
D	Agri-horticulture system	IV. Grasses and trees

Choose the correct answer from the options given below:

(A) (A) - (IV), (B) - (II), (C) - (III), (D) - (I)

(B) (A) - (I), (B) - (IV), (C) - (III), (D) - (II)

(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (C) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

Solution:

- Farm Forestry (A - III): Involves trees planted along the boundaries of agricultural fields for soil conservation and shade.



- Silvipastrol System (B - IV): Incorporates grasses and trees to support livestock.
- Agri-silviculture System (C - II): Integrates trees with crops for optimal land use.
- Agri-horticulture System (D - I): Combines fruit trees with fruit crops to increase agricultural output.

Quick Tip

Remember the key associations: Farm forestry (boundary trees), silvipastrol (grasses/trees), agri-silviculture (trees/crops), and agri-horticulture (fruit crops).

Question 26: The quantity of soil moved during wind erosion is influenced by:

- (A) Particle size
- (B) Gradation of particles
- (C) Wind velocity patterns
- (D) Distance on the land surface

Choose the correct answer from the options given below:

- (A) (A), (B), (C), and (D) only
- (B) (A), (B), and (D) only
- (C) (A), (B), and (C) only
- (D) (A), (C), and (D) only

Correct Answer: (A) (A), (B), (C), and (D) only

Solution:

- Particle size: Larger particles are harder to move, while smaller particles can be easily displaced.
- Gradation of particles: The distribution of particle sizes influences wind erosion intensity.
- Wind velocity patterns: Higher wind speeds increase soil displacement.
- Distance on the land surface: Longer unprotected stretches allow more soil to be eroded.



Quick Tip

To minimize wind erosion, employ windbreaks, soil coverings, and particle aggregation techniques.

Question 27: Sand dunes can be stabilized by:

- (A) Natural regeneration of the vegetative cover
- (B) Leveling
- (C) Artificial creation of the vegetative cover
- (D) Use of chemicals

Choose the correct answer from the options given below:

- (A) (A), (C), and (D) only
- (B) (A), (B), and (D) only
- (C) (A), (B), (C), and (D)
- (D) (B), (C), and (D) only

Correct Answer: (A) (A), (C), and (D) only

Solution:

- Natural regeneration (A): Allowing native plants to regrow reduces erosion.
- Artificial vegetation (C): Deliberately planting vegetation stabilizes the sand.
- Use of chemicals (D): Binding agents can consolidate sand particles to prevent movement.

Quick Tip

Focus on vegetation strategies for sustainable dune stabilization.

Question 28: If $40 \text{ m}^3/\text{s}$ is pumped into a distribution system and $30 \text{ m}^3/\text{s}$ is delivered to a turnout 3 km from the pumps, what is the water conveyance efficiency?

- (A) 12%
- (B) 90%
- (C) 75%



(D) 7.5%

Correct Answer: (C) 75%

Solution:

- Water conveyance efficiency is calculated as:

$$\text{Efficiency (\%)} = \left(\frac{\text{Delivered flow rate}}{\text{Pumped flow rate}} \right) \times 100$$

- Substituting values:

$$\text{Efficiency} = \left(\frac{30}{40} \right) \times 100 = 75\%$$

Quick Tip

Water conveyance efficiency decreases with leakage and evaporation; monitor systems regularly.

Question 29: Irrigation requirement (IR) over a growing season by the crop is calculated using the formula:

(A) $IR = [(ET - Pe)(1 + LR)]/Ea$

(B) $IR = [(ET - Pe)(LR)]/Ea$

(C) $IR = [(Pe - ET)(1 + LR)]/Ea$

(D) $IR = [(Pe - ET)(LR)]/Ea$

Correct Answer: (A) $IR = [(ET - Pe)(1 + LR)]/Ea$

Solution:

- ET (Evapotranspiration): Seasonal crop water requirement.
- Pe (Effective rainfall): The precipitation available for use.
- LR (Leaching requirement): Water needed to flush salts.
- Ea (Application efficiency): Efficiency of the irrigation system.
- The formula ensures water needs are met considering losses.



Quick Tip

Effective rainfall reduces irrigation needs; calculate accurately to save water.

Question 30: Match List I with List II:

List I	Crop	List II Stage for Irrigation
A	Rice	I. Silking, Tasseling
B	Wheat	II. Panicle initiation, Flowering
C	Sorghum	III. Seedling, Flowering
D	Maize	IV. Crown root initiation, Jointing, Milking

Choose the correct answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(B) (A) - (II), (B) - (IV), (C) - (III), (D) - (I)

(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (B) (A) - (II), (B) - (IV), (C) - (III), (D) - (I)

Solution:

- Rice (A): Requires irrigation at panicle initiation and flowering.
- Wheat (B): Demands water at crown root initiation and jointing.
- Sorghum (C): Needs irrigation at seedling and flowering stages.
- Maize (D): Requires irrigation at silking and tasseling stages.

Quick Tip

Irrigate crops during their critical growth stages to ensure maximum yield and water efficiency.

Question 31: Approaches adopted for irrigation scheduling:

(A) Soil moisture depletion approach

(B) Plant basis or plant indices



(C) Climatological approach

(D) Critical growth approach

Choose the **correct** answer from the options given below:

(A) (A), (C) and (D) only

(B) (A), (B) and (D) only

(C) (B), (C) and (D) only

(D) (A), (B), (C) and (D)

Correct Answer: (D) (A), (B), (C) and (D)

Solution:

The four listed approaches are fundamental for effective irrigation scheduling. Each method optimizes water usage and crop growth under various conditions. These include soil monitoring, plant growth indices, climatic factors, and crop growth stages.

Quick Tip

Remember: For irrigation scheduling, consider soil, plant, climate, and growth stages together to ensure optimal water use and crop productivity.

Question 32: Drainage is poor in soil with a structure type:

(A) Prismatic

(B) Platy

(C) Blocky

(D) Granular

Correct Answer: (B) Platy

Solution:

Platy soil structure has horizontal plates or layers that impede water movement, leading to poor drainage. It contrasts with blocky or granular structures, which are better suited for water infiltration and drainage.



Quick Tip

Platy soil structure = poor drainage. Identify horizontal layers in soil to predict water-logging risks.

Question 33: Drainage coefficient is the depth (centimetres) of water drained off from a given area in:

- (A) 1 hour
- (B) 2 hours
- (C) 24 hours
- (D) 30 minutes

Correct Answer: (C) 24 hours

Solution:

The drainage coefficient refers to the depth of water (in centimetres) that drains off an area over a standard period of 24 hours. This is a common metric in agricultural and hydrological studies for assessing drainage performance.

Quick Tip

Remember: The drainage coefficient standard is based on a 24-hour time frame for accurate measurement.

Question 34: Drains are designed to lower and maintain the groundwater below the root zone. Based on the position they are classified as:

- (A) Surface and Sub-surface drainage
- (B) Open drains and Relief drains
- (C) Random field ditches and Parallel field ditches
- (D) Mole drains and Vertical drains

Correct Answer: (C) Random field ditches and Parallel field ditches



Solution:

Random field ditches and parallel field ditches are drainage methods that help manage surface water and prevent waterlogging by directing excess water into suitable outlets. They are commonly used in agricultural fields.

Quick Tip

Random ditches are irregularly placed, while parallel ditches follow a systematic layout. Both aim to prevent water stagnation.

Question 35: Match List I with List II:

LIST I	Channel side slopes ratio	LIST II	Texture
(A)	1:1	I	Loose sandy loam
(B)	1.5:1	II	Clay
(C)	2:1	III	Silt loam
(D)	3:1	IV	Sandy loam

Choose the **correct** answer from the options given below:

- (A) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
(B) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(C) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)
(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (A) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

Solution:

The matching is based on the suitability of side slope ratios for various soil textures. Clay requires a 1:1 slope, silt loam works well with a 1.5:1 slope, sandy loam fits a 2:1 slope, and loose sandy loam is suited for a 3:1 slope.



Quick Tip

Remember to match steeper slopes with more cohesive soils like clay and gentler slopes with looser soils like sandy loam.

Question 36: In the sub-surface drainage method, parallel laterals enter the main line from both sides at an angle.

- (A) Gridiron
- (B) Interceptor
- (C) Herringbone
- (D) Random

Correct Answer: (C) Herringbone

Solution:

In the herringbone sub-surface drainage system, parallel laterals connect to the main drain at an angle, resembling the pattern of fish bones. This method is efficient for areas requiring uniform drainage.

Quick Tip

Herringbone pattern = angled laterals connecting to the main line. Remember this fish-bone layout for uniform drainage.

Question 37: Effective velocity of flow through the soil is proportional to hydraulic gradient.

- (A) Hooghoudt's Law
- (B) Darcy's Law
- (C) Pascal's Law
- (D) Lacey's Theory

Correct Answer: (B) Darcy's Law

Solution:



Darcy's Law states that the velocity of flow through a porous medium is proportional to the hydraulic gradient. It is a fundamental principle in soil mechanics and groundwater flow.

Quick Tip

Darcy's Law: Flow velocity = permeability $\times$ hydraulic gradient. Think "Darcy" for proportional soil flow.

Question 38: Single auger hole method for determination of hydraulic conductivity was developed by:

- (A) Darcy
- (B) Lacey
- (C) Hooghoudt
- (D) Kennedy

Correct Answer: (C) Hooghoudt

Solution:

The single auger hole method, developed by Hooghoudt, is used to measure hydraulic conductivity in soils. It involves analyzing the rate of water flow into or out of a borehole.

Quick Tip

Hooghoudt = hydraulic conductivity via auger hole. Link "Hooghoudt" with borehole flow measurement.

Question 39: Level at which water stands in a well before pumping starts:

- (A) Static water level
- (B) Pumping water level
- (C) Piezometric water surface
- (D) Drawdown



Correct Answer: (A) Static water level

Solution:

The static water level refers to the natural level at which water stands in a well under non-pumping conditions. It represents the equilibrium level of the water table.

Quick Tip

Static water level = equilibrium level before pumping. Remember it as "static = no motion."

Question 40: Ratio of the saturated thickness of semi-pervious layer to hydraulic conductivity of the vertical flow:

- (A) Hydraulic resistance
- (B) Hydraulic conductivity
- (C) Transmissivity
- (D) Specific retention

Correct Answer: (A) Hydraulic resistance

Solution:

Hydraulic resistance is calculated as the ratio of the saturated thickness of a semi-pervious layer to its hydraulic conductivity. It measures the ability of the layer to resist vertical water flow.

Quick Tip

Hydraulic resistance = thickness $\div$ conductivity. Think "resistance" as opposing water flow.

Question 41: A pump which does not require any external power for its operation to raise water is:

- (A) Centrifugal pump



- (B) Axial flow pump
- (C) Mixed flow pump
- (D) Hydraulic pump

Correct Answer: (D) Hydraulic pump

Solution:

Hydraulic pumps, such as the hydraulic ram, utilize the energy of flowing water (potential or kinetic) to raise a portion of the water to a higher elevation without requiring external power sources.

Quick Tip

Hydraulic pumps operate using the energy of water itself. Remember "Hydraulic = self-powered."

Question 42: Pump efficiency is a product of the following efficiencies:

- (A) Hydraulic efficiency
- (B) Volumetric efficiency
- (C) Mechanical efficiency
- (D) Water conveyance efficiency

Choose the **correct** answer from the options given below:

- (A) (A), (B) and (D) only
- (B) (A), (B) and (C) only
- (C) (A), (B), (C) and (D)
- (D) (A), (C) and (D) only

Correct Answer: (B) (A), (B) and (C) only

Solution:

Pump efficiency is primarily determined by the hydraulic, volumetric, and mechanical efficiencies. These components ensure efficient energy transfer and minimize losses. Water conveyance efficiency is not a direct factor in calculating pump efficiency.



Quick Tip

Pump efficiency = Hydraulic $\times$ Volumetric $\times$ Mechanical efficiencies. Exclude water conveyance for accurate calculations.

Question 43. The plotting of flow rate vs pump efficiency gives ----- shaped curve.

- (A) 'U' shaped
- (B) Inverted 'U' shaped
- (C) 'N' shaped
- (D) Inverted 'N' shaped

Correct Answer: (B) Inverted 'U' shaped

Solution: The efficiency of a pump typically follows an inverted 'U' shaped curve when plotted against flow rate. This happens because the pump operates most efficiently at its best efficiency point (BEP). Beyond this point, losses due to turbulence and flow separation cause efficiency to decrease.

Quick Tip

Pump efficiency is calculated as Hydraulic Efficiency $\times$ Volumetric Efficiency $\times$ Mechanical Efficiency. Use the BEP for optimal operations.

Question 44. Movement of water through a column of soil is called -----.

- (A) Percolation
- (B) Infiltration
- (C) Seepage
- (D) Precipitation

Correct Answer: (A) Percolation

Solution: Percolation refers to the vertical movement of water through the soil layers under the influence of gravity. This is a critical process for groundwater recharge and depends on soil texture, porosity, and structure.



Quick Tip

Percolation is the vertical movement of water in soil, distinct from infiltration, which refers to surface water entering the soil.

Question 45. Evapotranspiration estimation methods include:

- (A) Energy balance and microclimatological methods
- (B) Soil-water balance method
- (C) From meteorological data
- (D) Pan evaporation

Choose the correct answer from the options given below:

- (A) (A), (B), and (D) only
- (B) (A), (B), (C), and (D)
- (C) (B), (C), and (D) only
- (D) (A), (C), and (D) only

Correct Answer: (B) (A), (B), (C), and (D)

Solution: Evapotranspiration estimation methods include:

- **Energy balance and microclimatological methods:** Uses the energy equation for water loss.
- **Soil-water balance method:** Calculates the difference between input and output water in the soil.
- **Meteorological data:** Utilizes climate parameters like temperature, humidity, and wind speed.
- **Pan evaporation:** Measures water evaporation directly from a standardized pan.

Quick Tip

Evapotranspiration = Evaporation + Transpiration. Use meteorological data for accurate regional estimates.

Question 46. Which of the following soil water is available to the plants?



- (A) Hygroscopic water
- (B) Capillary water
- (C) Gravitational water
- (D) Free water

Correct Answer: (B) Capillary water

Solution: Capillary water is the type of soil water that is held in micropores and is readily available for plant roots. Unlike hygroscopic water, which is tightly bound to soil particles, and gravitational water, which drains quickly, capillary water remains accessible to plants.

Quick Tip

Capillary water is the primary source of water for plants. It remains in the soil's micropores after gravitational water drains away.

Question 47. The volume of water present in the total volume of pores of soil refers to

-----.

- (A) Degree of saturation
- (B) Volume wetness
- (C) Mass wetness
- (D) Moisture tension

Correct Answer: (A) Degree of saturation

Solution: Degree of saturation refers to the proportion of pore volume in the soil that is filled with water. It is expressed as a percentage and indicates how saturated the soil is with water. This metric is crucial for understanding soil moisture content.

Quick Tip

Degree of saturation (

Question 48. Groundwater exploration methods for sub-surface investigation are:

- (A) Test drilling
- (B) Electric logging



(C) Gamma-ray logging

(D) Electrical resistivity

Choose the correct answer from the options given below:

(A) (A), (B), and (D) only

(B) (A), (B), (C) only

(C) (B) and (C) only

(D) (B), (C), and (D) only

Correct Answer: (B) (A), (B), (C), and (D)

Solution: Groundwater exploration methods include:

- **Test drilling:** Provides direct data about sub-surface layers.
- **Electric logging:** Measures the electrical conductivity of underground formations.
- **Gamma-ray logging:** Detects natural radioactivity in rocks and sediments.
- **Electrical resistivity:** Identifies water-bearing formations based on their resistivity.

Quick Tip

Use a combination of methods, such as test drilling and electrical logging, for precise groundwater exploration.

Question 49. Match List I with List II:

List I (Property)	List II (Type of Aquifer)
(A) Transmissibility	(I) Unconfined percentage
(B) Hydraulic conductivity	(II) Confined, Semi-confined
(C) Specific yield	(III) Semi-confined aquifer
(D) Hydraulic resistance	(IV) All aquifers

Choose the correct answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(B) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (B) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)



Solution: - Transmissibility (A) is linked to **Confined, Semi-confined (II)** as it measures the ability of a confined aquifer to transmit water.

- Hydraulic conductivity (B) relates to **All aquifers (IV)** since it reflects the permeability of all aquifer types.

- Specific yield (C) corresponds to **Unconfined percentage (I)** because it quantifies the amount of water that can be drained under gravity from unconfined aquifers.

- Hydraulic resistance (D) matches **Semi-confined aquifer (III)** due to its role in delaying water flow in semi-confined systems.

Quick Tip

Matching questions require a solid understanding of the properties and their relevance to specific aquifer types. Focus on key characteristics for correct pairings.

Question 50. Volume of water released or stored per unit surface area of the aquifer per unit change in the component of head normal to that of surface.

(A) Specific yield

(B) Specific retention

(C) Coefficient of storage

(D) Hydraulic resistance

Correct Answer: (C) Coefficient of storage

Solution: The coefficient of storage is defined as the volume of water released or stored per unit surface area of an aquifer per unit change in hydraulic head. It is a dimensionless parameter and is critical for evaluating the storage capacity of confined aquifers.

Quick Tip

Coefficient of storage applies to confined aquifers and is key for groundwater management and modeling.

Question 51. Specific yield values for different sub-soil increases for soil types in the following sequence:



- (A) Clay
- (B) Coarse sand
- (C) Silt
- (D) Fine sand

Choose the correct answer from the options given below:

- (A) (A), (C), (D), (B)
- (B) (A), (B), (C), (D)
- (C) (B), (D), (C), (A)
- (D) (A), (C), (D), (B)

Correct Answer: (D) (A), (C), (D), (B)

Solution: Specific yield increases with soil particle size. The correct sequence is clay, silt, fine sand, and coarse sand, as clay retains water the most and coarse sand drains the fastest.

Quick Tip

Specific yield is inversely related to soil water retention. Larger particles like sand yield more water compared to smaller particles like clay.

Question 52. Depth of well is the sum of:

- (A) Depth of water table below ground surface
- (B) Storage depth
- (C) Height of the well above ground surface
- (D) Drawdown

Choose the correct answer from the options given below:

- (A) (A), (B), and (D) only
- (B) (A), (B), and (C) only
- (C) (A), (B), (C), and (D)
- (D) (A), (C), and (D) only

Correct Answer: (A) (A), (B), and (D) only

Solution: The depth of a well is calculated as the sum of the depth of the water table below ground surface, the storage depth, and the drawdown. The height of the well above ground



does not influence the depth calculation.

Quick Tip

Exclude above-ground structures while calculating well depth. Focus on subsurface components for accuracy.

Question 53. Battery of wells is specially adopted under the following conditions:

- (A) Shallow water table
- (B) Installation of medium and deep tube wells is not economical
- (C) Hydraulic characteristics of the aquifer are poor
- (D) Salts are present in the deeper layers

Choose the correct answer from the options given below:

- (A) (A), (B), (C), and (D)
- (B) (A), (C), and (D) only
- (C) (A), (B), and (C) only
- (D) (B), (C), and (D) only

Correct Answer: (A) (A), (B), (C), and (D)

Solution: A battery of wells is employed when the water table is shallow, medium and deep tube wells are uneconomical, aquifers have poor hydraulic properties, and deeper layers contain salts.

Quick Tip

A battery of wells is suitable for shallow aquifers or areas where deep drilling is costly or unfeasible.

Question 54. Match List I with List II:



List I (Well Drilling Equipment)	List II (Characteristic/Type of Function)
(A) Percussion drills	(I) Drilling deep holes in unconsolidated formations
(B) Rotary drills	(II) Drilling in hard rock areas
(C) Down-the-hole hammer drills	(III) Operating tool in up and down motion
(D) Core drills	(IV) To obtain uncontaminated samples

Choose the correct answer from the options given below:

- (A) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)
 (B) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
 (C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
 (D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (A) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)

Solution: - Percussion drills operate in an up-and-down motion (III).

- Rotary drills are ideal for drilling deep holes in unconsolidated formations (I).
- Down-the-hole hammer drills are used for hard rock areas (II).
- Core drills are for obtaining uncontaminated samples (IV).

Quick Tip

Match drilling equipment to their specific functions for effective application in well construction.

Question 55. Gravel pack ratio (P-A) generally ranges from:

- (A) 2-4
 (B) 4-9
 (C) 10-12
 (D) 12-16

Correct Answer: (B) 4-9

Solution: The gravel pack ratio (P-A) typically ranges from 4-9. This range ensures effective filtration and minimizes clogging in well screens.



Quick Tip

Maintain a gravel pack ratio between 4 and 9 for optimal well performance and minimal clogging.

Question 56. Match List I with List II:

List I (Types of Remote Sensing)	List II (Classification Criteria)
(A) Active remote sensing	(I) Based on number of spectral bands
(B) Microwave remote sensing	(II) Based on sensor platform
(C) Airborne remote sensing	(III) Based on source of energy
(D) Multispectral remote sensing	(IV) Based on spectral regions

Choose the correct answer from the options given below:

(A) (A) - (I), (B) - (IV), (C) - (III), (D) - (II)

(B) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (B) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

Solution: - Active remote sensing (A): Relies on its own source of energy to detect objects (III).

- Microwave remote sensing (B): Utilizes different spectral regions for data collection (IV).

- Airborne remote sensing (C): Performed using airborne sensor platforms like drones or aircraft (II).

- Multispectral remote sensing (D): Classifies based on the number of spectral bands used (I).

Quick Tip

For matching remote sensing types, focus on the key characteristics of energy, spectrum, platform, and bands.

Question 57. Match List I with List II:



List I (Spectral Region)	List II (Fields of Remote Sensing)
(A) Middle infrared	(I) Surface heat capacity, surface temperature
(B) Near infrared	(II) Land cover, biological properties
(C) Thermal infrared	(III) Surface physical properties, atmospheric precipitation
(D) Microwave	(IV) Surface chemical composition, atmospheric chemical composition

Choose the correct answer from the options given below:

- (A) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)
 (B) (A) - (II), (B) - (III), (C) - (I), (D) - (IV)
 (C) (A) - (IV), (B) - (II), (C) - (I), (D) - (III)
 (D) (A) - (III), (B) - (IV), (C) - (II), (D) - (II)

Correct Answer: (C) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

Solution: - Middle infrared (A): Focuses on surface chemical composition and atmospheric chemical composition (IV).

- Near infrared (B): Used for analyzing surface heat capacity and surface temperature (I).
- Thermal infrared (C): Helps in studying land cover and biological properties (II).
- Microwave (D): Involves surface physical properties and atmospheric precipitation (III).

Quick Tip

Match spectral regions to their distinct remote sensing applications for heat, composition, and biological properties.

Question 58. The wavelength of the spectral regions in the electromagnetic spectrum increases in the sequence:

- (A) Microwave
 (B) Visible
 (C) Thermal Infrared
 (D) Near Infrared

Choose the correct answer from the options given below:

- (A) (B), (A), (C), (D)
 (B) (B), (D), (C), (A)



(C) (B), (A), (D), (C)

(D) (C), (B), (D), (A)

Correct Answer: (B) (B), (D), (C), (A)

Solution: The wavelength order is as follows:

- Visible (B): Shortest wavelength among the given options.
- Near Infrared (D): Longer than visible but shorter than thermal infrared.
- Thermal Infrared (C): Longer wavelength compared to NIR.
- Microwave (A): Longest wavelength among the given options.

Quick Tip

In the electromagnetic spectrum, wavelength increases as frequency decreases.

Question 59. When we make a false colour composite and allot Red colour to NIR, Green colour to Red, and Blue colour to Green bands, the vegetation in the image is represented by:

- (A) Green colour
- (B) Red colour
- (C) Blue colour
- (D) Violet colour

Correct Answer: (B) Red colour

Solution: In a false colour composite:

- Vegetation reflects strongly in the NIR band, which is assigned Red.
- Therefore, vegetation is represented as Red in the false colour image.

Quick Tip

For vegetation analysis in false colour composites, NIR is typically represented by Red.

Question 60. Gully formation has different stages. Arrange each stage in the correct sequence of their development:

- (A) Gully heads get enlarged and the gully bed gets deepened



- (B) Local vegetation begins to establish
- (C) Channel erosion
- (D) Gully stabilizes

Choose the correct answer from the options given below:

- (A) (A), (B), (C), (D)
- (B) (A), (C), (B), (D)
- (C) (C), (A), (B), (D)
- (D) (C), (B), (A), (D)

Correct Answer: (C) (C), (A), (B), (D)

Solution: The stages of gully formation are:

1. Channel erosion (C): Initial stage where water flow erodes the soil.
2. Gully heads get enlarged (A): Continued erosion deepens the gully bed.
3. Vegetation establishment (B): Vegetation begins to grow and stabilize the soil.
4. Gully stabilizes (D): Final stage where erosion halts due to vegetation.

Quick Tip

Gully formation follows the sequence: erosion, deepening, vegetation growth, and stabilization.

Question 61. Wischmeier and Smith (1978) gave the growth stages for calculation of the crop management factor. Put them in the right sequence:

- (A) Establishment
- (B) Stubble
- (C) Seed bed
- (D) Growing period

Choose the correct answer from the options given below:

- (A) (A), (B), (C), (D)
- (B) (C), (A), (D), (B)
- (C) (B), (C), (A), (D)
- (D) (C), (D), (A), (B)

Correct Answer: (B) (C), (A), (D), (B)



Solution: The correct sequence for crop management factor calculation is:

1. Seed bed (C): Initial stage where the crop is sown.
2. Establishment (A): The crop starts growing and establishing roots.
3. Growing period (D): Crop reaches maturity.
4. Stubble (B): Residue left after harvesting.

Quick Tip

Remember: The crop management stages follow the natural growth and harvest cycle: seed bed, establishment, growing, and stubble.

Question 62. The maximum permissible velocity (cm/s) in case of earthen channels for various soil types increases in the order:

- (A) Sand and silt
- (B) Clay
- (C) Loam and sandy loam
- (D) Clay loam

Choose the correct answer from the options given below:

- (A) (A), (C), (B), (D)
- (B) (A), (C), (D), (B)
- (C) (B), (A), (D), (C)
- (D) (B), (D), (C), (A)

Correct Answer: (B) (A), (C), (D), (B)

Solution: The permissible velocity order is:

1. Sand and silt (A): Highest velocity as these soils are less cohesive.
2. Loam and sandy loam (C): Moderate velocity due to balanced texture.
3. Clay loam (D): Lower velocity due to higher cohesiveness.
4. Clay (B): Lowest velocity as it is the most cohesive and erodes easily.



Quick Tip

Cohesive soils like clay allow lower velocities, while less cohesive soils like sand tolerate higher velocities.

Question 63. Match List I with List II:

List I (Method for estimating ET)	List II (Equation)
(A) Modified Blaney-Criddle method	(I) $ET_0 = c(W R_n)$ where, W is a weighting factor depending on temperature and altitude, R_n is the net radiation at the ground level.
(B) Radiation method	(II) $ET_0 = K_p E_{pan}$ where, E_{pan} is pan evaporation, K_p is the pan coefficient.
(C) Modified Penman method	(III) $ET_0 = c[P(0.46T + 8)]$ where, T is mean daily temperatures and P is the mean daily percentage of annual daytime hours.
(D) Pan Evaporation	(IV) $ET_0 = c(W R_n) + (1 - W)f(u)(e_a - e_d)$ where, W is a weighting factor depending on temperature, R_n is the net radiation, $f(u)$ is the wind-related function, $(e_a - e_d)$ is the difference between saturation vapor pressure and actual pressure.

Choose the correct answer from the options given below:

- (A) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)
- (B) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
- (C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)



(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (A) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Solution: The correct matching is: - Modified Blaney-Criddle method (A):

$$ET_0 = c(P[0.46T + 8]) \text{ (III).}$$

- Radiation method (B): $ET_0 = c(W R_s)$ (I).

- Modified Penman method (C): $ET_0 = c(W R_n) + (1 + W)f(u)(e_s - e_d)$ (IV).

- Pan Evaporation (D): $ET_0 = K_p E_{pan}$ (II).

Quick Tip

When matching methods for estimating evapotranspiration (ET), focus on the key parameters: radiation (R_s , R_n), temperature (T), and pan evaporation (E_{pan}).

Question 64. Match List I with List II:

List I (Pressure)	List II (Characteristic)
(A) Atmospheric pressure	(I) Sub-atmospheric pressure
(B) Absolute pressure	(II) Barometric pressure
(C) Gauge pressure	(III) Absolute zero is taken as datum
(D) Vacuum pressure	(IV) Local atmospheric pressure as datum

Choose the correct answer from the options given below:

(A) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)

(B) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

(C) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (B) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

Solution: The correct matching is: - Atmospheric pressure (A): Corresponds to barometric pressure (II). - Absolute pressure (B): Uses absolute zero as the datum (III). - Gauge pressure (C): Measured with local atmospheric pressure as the datum (IV). - Vacuum pressure (D): Indicates sub-atmospheric pressure (I).



Quick Tip

When matching pressure types, remember their reference points: absolute zero, atmospheric pressure, or sub-atmospheric conditions.

Question 65. Match List I with List II:

List I (Theory Proposed)	List II (Law)
(A) Intensity of pressure at a point in a static fluid is equal in all directions	(I) Stokes' Law
(B) Terminal velocity is directly proportional to the radius of a sphere	(II) Darcy's Law
(C) Flow of water through soil could be compared to the flow of heat through a metal bar or flow of electricity	(III) Pascal's Law
(D) Flow rate through the porous medium is directly proportional to the head loss and inversely proportional to the length of flow	(IV) Buckingham's Law

Choose the correct answer from the options given below:

- (A) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
- (B) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
- (C) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)
- (D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (C) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Solution: The correct matching is: - (A) Intensity of pressure at a point in a static fluid is equal in all directions: Pascal's Law (III).



- (B) Terminal velocity is directly proportional to radius of sphere: Stoke's Law (I).
- (C) Flow of water through soil could be compared to the flow of heat through metal bar or flow of electricity: Buckingham (IV).
- (D) Flow rate through the porous medium is directly proportional to the head loss and inversely proportional to the length of flow: Darcy's Law (II).

Quick Tip

When matching laws, relate physical phenomena such as fluid pressure, terminal velocity, and flow through porous media to their corresponding theoretical laws.

Question 66. Match List I with List II:

List I (Terms)	List II (Referred to)
(A) Summation Curve	(I) Average infiltration rate
(B) ϕ -Index	(II) S-hydrograph
(C) W-Index	(III) Rate of rainfall above which the rainfall equals the runoff volume
(D) Base flow	(IV) Sub-surface runoff

Choose the correct answer from the options given below:

- (A) (A) - (II), (B) - (III), (C) - (I), (D) - (IV)
- (B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
- (C) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)
- (D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (A) (A) - (II), (B) - (III), (C) - (I), (D) - (IV)

Solution: The correct matching is: - (A) Summation Curve: Refers to the S-hydrograph (II).

- (B) ϕ -Index: Refers to the rate of rainfall above which the rainfall equals the runoff volume (III).
- (C) W-Index: Refers to the average infiltration rate (I).
- (D) Base flow: Refers to sub-surface runoff (IV).



Quick Tip

Hydrology terms like ϕ -Index and W-Index are often used to describe rainfall-runoff relationships and infiltration rates. Familiarize yourself with their definitions for clarity.

Question 67. Match List I with List II:

List I	List II
(A) Kirkham	(I) Design discharge capacity for open ditches
(B) Hooghoudt's equation	(II) Soil loss equation
(C) Cypress Creek formula	(III) Rate at which the auger hole filled is directly proportional to the circumference of the hole and is inversely proportional to the cross-sectional area
(D) Wischmeier	(IV) Pipe cavity method

Choose the correct answer from the options given below:

- (A) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
- (B) (A) - (IV), (B) - (II), (C) - (III), (D) - (I)
- (C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
- (D) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

Correct Answer: (D) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

Solution: The correct matching is: - (A) Kirkham: Refers to the rate at which the auger hole is filled, directly proportional to the circumference of the hole and inversely proportional to the cross-sectional area (III).

- (B) Hooghoudt's equation: Refers to the design discharge capacity for open ditches (I).
- (C) Cypress Cree formula: Refers to the pipe cavity method (IV).
- (D) Wischmeier: Refers to the soil loss equation (II).

Quick Tip

To solve matching questions effectively, focus on the primary applications of each formula and understand their relationships with the given characteristics.



Question 68. Digital satellite image processing steps in proper order:

- (A) Image enhancement
- (B) Image transformation
- (C) Radiometric and geometric corrections
- (D) Image classification

Choose the correct answer from the options given below:

- (A) (A), (B), (C), (D)
- (B) (C), (B), (D), (A)
- (C) (B), (A), (C), (D)
- (D) (C), (A), (B), (D)

Correct Answer: (D) (C), (A), (B), (D)

Solution: The proper sequence of digital satellite image processing is:

1. Radiometric and geometric corrections (C): To correct sensor and geometric distortions.
2. Image enhancement (A): To improve visual interpretability.
3. Image transformation (B): To analyze images with specific algorithms.
4. Image classification (D): To categorize images into meaningful classes.

Quick Tip

Understand the sequence for processing satellite images: corrections → enhancement → transformation → classification.

Question 69. Arrange the milestones in India's space programme in chronological order:

- (A) Bhaskara
- (B) First SLV
- (C) Aryabhata
- (D) Rohini

Choose the correct answer from the options given below:

- (A) (A), (C), (B), (D)
- (B) (C), (A), (B), (D)



(C) (B), (A), (D), (C)

(D) (C), (B), (D), (A)

Correct Answer: (B) (C), (A), (B), (D)

Solution: The correct chronological order of milestones in India's space programme is:

1. Aryabhata (C): Launched in 1975, India's first satellite.
2. Bhaskara (A): Launched in 1979, focused on Earth observation.
3. First SLV (B): Successful launch of Satellite Launch Vehicle in 1980.
4. Rohini (D): First satellite placed in orbit by an Indian rocket.

Quick Tip

Learn India's space milestones chronologically: Aryabhata → Bhaskara → SLV → Rohini.

Question 70. Steps in a flow-chart for land use planning through remote sensing:

(A) Land capability classes

(B) Digital elevation model

(C) Processing of satellite data

(D) Identify the land based on slope and soil characteristics

Choose the correct answer from the options given below:

(A) (D), (C), (B), (A)

(B) (C), (B), (A), (D)

(C) (B), (C), (D), (A)

(D) (C), (B), (D), (A)

Correct Answer: (D) (C), (B), (D), (A)

Solution: The correct sequence for land use planning through remote sensing is:

1. Processing of satellite data (C): To gather geospatial information.
2. Digital elevation model (B): To understand topography.
3. Identify the land based on slope and soil characteristics (D): To assess land suitability.
4. Land capability classes (A): To classify land based on its capabilities.



Quick Tip

For land use planning: process satellite data → elevation model → slope/soil identification → land capability classes.

Question 71. Match List I with List II:

List I (Characteristic of Use)	List II (Name)
(A) When water is pumped from the source	(I) Gate stands
(B) Control the flow of water into the branches of the pipeline	(II) Inlet structure
(C) When the pipeline is installed on steep slopes	(III) Float valve stands
(D) Open stand structure used in semi-closed pipelines	(IV) Overflow stands

Choose the correct answer from the options given below:

(A) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

(B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)

(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Correct Answer: (A) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

Solution: - (A) When water is pumped from the source → Inlet structure (II): Manages the entry of water at the source.

- (B) Control the flow of water into the branches of the pipeline → Gate stands (I): Regulates water flow to branches.

- (C) When the pipeline is installed on steep slopes → Overflow stands (IV): Prevents overflow and stabilizes the flow.

- (D) Open stand structure used in semi-closed pipelines → Float valve stands (III): Ensures consistent pressure in semi-closed pipelines.

Quick Tip

Review the use cases of water management structures to effectively match their characteristics with their names.



Question 72. Manning's roughness coefficient (n) varies with the type of surface, while calculating the time of concentration of the catchment. Arrange the surface types in increasing order for n :

- (A) Pasture or average grass
- (B) Cultivated row crops
- (C) Smooth impervious surface
- (D) Timberland with deep forest litter

Choose the correct answer from the options given below:

- (A) (A), (B), (C), (D)
- (B) (C), (D), (A), (B)
- (C) (C), (B), (D), (A)
- (D) (C), (B), (A), (D)

Correct Answer: (C) (C), (B), (D), (A)

Solution: The Manning's roughness coefficient (n) increases with surface complexity:

- Smooth impervious surfaces have the lowest n .
- Timberland with deep forest litter has the highest n due to vegetation and uneven terrain.

Quick Tip

For Manning's coefficient, consider that more complex terrain increases resistance and n .

Question 73. The value of C factor in the RUSLE equation for different land use types in decreasing order will be:

- (A) Forests
- (B) Bare
- (C) Row crops
- (D) Pasture

Choose the correct answer from the options given below:

- (A) (A), (D), (C), (B)
- (B) (A), (C), (B), (D)
- (C) (B), (A), (D), (C)



(D) (C), (B), (D), (A)

Correct Answer: (A) (A), (D), (C), (B)

Solution: The C factor values are higher for forests due to their natural vegetation cover, followed by pastures, row crops, and bare land.

Quick Tip

C factor decreases with better vegetation cover, reducing soil erosion.

Question 74. Total depth of irrigation required by a crop (cm) to come to maturity is termed as its Delta. Arrange the given crops in increasing value of Delta:

(A) Sugarcane

(B) Wheat

(C) Maize

(D) Cotton

Choose the correct answer from the options given below:

(A) (C), (B), (A), (D)

(B) (C), (B), (D), (A)

(C) (C), (A), (D), (B)

(D) (C), (A), (B), (D)

Correct Answer: (B) (C), (B), (D), (A)

Solution: Delta values represent the depth of water required for crop maturity: - Maize ; Wheat ; Cotton ; Sugarcane.

Quick Tip

Delta values increase with water requirements for crop growth.

Question 75. A flowing well getting its supply from an aquifer where the water is under such high pressure that it overflows at the top is called:

(A) Artesian well

(B) Semi-artesian well



(C) Water tube well

(D) Skimming well

Correct Answer: (A) Artesian well

Solution: An artesian well taps into an aquifer where water pressure causes it to flow naturally to the surface without pumping.

Quick Tip

Artesian wells rely on natural pressure for water flow.

