

CUET PG 2024 Soil Science Soil and Water Conservation Question Paper with Solutions

Time Allowed :1 Hour 45 Mins	Maximum Marks :300	Total Questions :75
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. The examination duration is 105 minutes. Manage your time effectively to attempt all questions within this period.
2. The total marks for this examination are 300. Aim to maximize your score by strategically answering each question.
3. There are 75 mandatory questions to be attempted in the Soil Science Soil and Water Conservation paper. Ensure that all questions are answered.
4. Questions may appear in a shuffled order. Do not assume a fixed sequence and focus on each question as you proceed.
5. The marking of answers will be displayed as you answer. Use this feature to monitor your performance and adjust your strategy as needed.
6. You may mark questions for review and edit your answers later. Make sure to allocate time for reviewing marked questions before final submission.
7. Be aware of the detailed section and sub-section guidelines provided in the exam. Understanding these will aid in effectively navigating the exam.

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: Frozen water particles that fall as precipitation are known as hail. Hailstones are formed in strong thunderstorm clouds, particularly those with intense updrafts, high liquid water content, great vertical extent, large water droplets, and where a portion of the cloud layer is below freezing 0°C (32°F).

💡 Quick Tip

Hail is a type of solid precipitation that is distinct because it consists of balls or irregular lumps of ice, unlike other forms of solid precipitation like snow or ice pellets.

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 relationship between the return period T and the probability of occurrence P in a given year is expressed as $T = 100/P$. This formula calculates how often, on average, an event is expected to occur over a specified interval. For instance, a 1

 Quick Tip

Understanding the relationship between T and P is crucial in risk management for events such as floods or other rare occurrences.

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 in DAD curves stands for Depth-Area-Duration. These curves are used in hydrology to describe the relationship between the depth of precipitation, the area over which it falls, and the duration over which it occurs.

 Quick Tip

DAD curves are essential tools for flood forecasting and water resource management.

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

- (a) Gully erosion
- (b) Stream channel erosion
- (c) Mass erosion
- (d) Rill erosion

Correct Answer: (d) Rill erosion.

Solution: Rill erosion refers to the formation of small, ephemeral channels, which can be easily smoothed over by normal tillage. It occurs when surface water runoff forms small channels as it flows over a slope.

💡 Quick Tip

Managing rill erosion is crucial for preserving soil fertility and preventing larger-scale erosion such as gully erosion.

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

- (a) Width greater than 18 m: Depth 9 to 12 m: side slope 8-15%
- (b) Width less than 18 m: Depth 9 to 12 m: side slope 5-7%
- (c) Width less than 18 m: Depth 3 to 9 m: side slope 8-15%
- (d) Width less than 18 m: Depth 3 to 9 m: side slope 5-7%

Correct Answer: (c) Width less than 18 m: Depth 3 to 9 m: side slope 8-15%.

Solution: A medium-sized gully typically has a width less than 18 meters, a depth ranging from 3 to 9 meters, and side slopes between 8% and 15%. This classification helps in understanding the scale of erosion and necessary measures for gully stabilization.

💡 Quick Tip

Gully stabilization can include practices such as planting vegetation, using check dams, and reshaping the land to divert water flow and reduce erosion.

6. I30 in 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: The I30 parameter in the calculation of the Erosion Index refers to the maximum 30-minute rainfall intensity during a storm. It is used to evaluate the erosive potential of rainfall events.

💡 Quick Tip

Maximum 30-minute rainfall intensity is a key factor in assessing rainfall erosivity and designing soil conservation measures.

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: Soil erosion by water starts with splash erosion, caused by the impact of raindrops. This is followed by sheet erosion, where soil is removed over a wide area. Next, rill erosion occurs, forming small channels, and finally, gully erosion creates larger and deeper channels.

💡 Quick Tip

Understanding the sequence of erosion helps in implementing targeted soil conservation measures.

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 is a simple technique for measuring the size of raindrops. When raindrops hit a prepared flour-water mixture, they form pellets that can be measured to determine their size.

 Quick Tip

Raindrop size is critical for understanding the erosive potential of rainfall and its impact on soil erosion.

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

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

Choose the correct answer from the options given below:

- (a) (A), (B), (D)
- (b) (A), (B), (C)
- (c) (A), (B), (C), (D)
- (d) (B), (C), (D)

Correct Answer: (a) (A), (B), (D).

Solution: The spacing of spurs in erosion control is determined by the formula $N = L/S + 1$, where N is the number of spurs, L is the total length of the eroded stream bank, S is the size of the spurs, and 1 accounts for the effective length of the spur extending into the stream bed. Proper identification of these parameters ensures optimal placement of spurs to control stream bank erosion.

 Quick Tip

Accurate spur spacing reduces erosion and stabilizes stream banks by distributing the energy of flowing water.

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), (C)
- (b) (A), (B), (D)
- (c) (B), (C), (D)
- (d) (A), (B), (C), (D)

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

Solution: The different types of strip cropping include contour strip cropping, field strip cropping, buffer strip cropping, and wind strip cropping. These methods are designed to reduce soil erosion, conserve moisture, and improve land productivity by alternating strips of different crops or vegetation along slopes or fields.

 Quick Tip

Strip cropping is an effective conservation practice for sustainable agriculture and soil erosion prevention.

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

- (a) $VI = 0.3[8/3 + 2]$
- (b) $VI = [2 + 5/3]0.3$
- (c) $VI = (XS + Y)0.3$
- (d) $VI = (XS + Y)0.3$

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

Solution: Cox's formula for contour bunds is $VI = (XS + Y)0.3$, where VI is the vertical interval, S is the slope factor, X is the rainfall factor, and Y is the infiltration and crop cover factor. This formula helps determine the spacing between contour bunds to control erosion effectively.

 Quick Tip

Contour bunding is a structural measure to prevent soil erosion by reducing the velocity of surface runoff.

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: The standard RUSLE (Revised Universal Soil Loss Equation) equation considers factors in the sequence of rainfall erosivity (A), soil erodibility (D), length and slope (B), and soil cover and practices (C). This order reflects the contribution of each factor to soil erosion.

 Quick Tip

The RUSLE equation is widely used for estimating annual soil erosion and planning erosion control measures.

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 prevents soil erosion by reducing the splash impact of raindrops on the soil and slowing down overland flow. It protects the soil surface, enhances water infiltration, and minimizes runoff.

 Quick Tip

Mulching is an effective and low-cost agronomic practice for soil conservation.

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), (C) only
- (b) (A), (B), (D) only
- (c) (A), (C), (D) only
- (d) (B), (C), (D) only

Correct Answer: (c) (A), (C), (D) only.

Solution: Agronomic measures for erosion control include strip cropping (A), mulching (C), and vegetative barriers (D). Contour bunding (B) is a structural measure, not an agronomic

one. These practices improve soil cover and reduce runoff velocity.

 Quick Tip

Agronomic measures focus on improving vegetation and soil management to control erosion naturally.

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 where soil particles are transported by wind or water in a series of jumps or bounces. It occurs due to the lifting of particles by the force of wind or water, followed by their deposition back onto the surface.

 Quick Tip

Saltation plays a significant role in soil erosion caused by wind and contributes to the movement of sand particles in deserts.

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

- (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 standard conditions for estimating soil erosion. These include a slope length of 22.6 meters, a slope steepness of 9%, and land use as fallow with ploughing. This standard helps in estimating soil loss across different regions based on specific land use and topography.

 Quick Tip

The USLE is essential for understanding and managing soil erosion in agricultural fields.

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 bunds are most effective on slopes ranging from 1 to 7 degrees. At these slopes, the bunds can effectively reduce soil erosion by controlling water runoff and conserving soil moisture.

 Quick Tip

Proper slope management is essential for the effectiveness of contour bunds in erosion control.

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: In turbine pumps, the flow from the impeller is mixed, meaning the fluid is subjected to both axial and radial flow components. These pumps are typically used for medium-head applications where the flow characteristics are a combination of axial and radial directions.

 Quick Tip

Mixed flow pumps are suitable for applications that require both high flow and moderate pressure.

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 for a centrifugal pump indicate that the head varies as the square of the speed, and the power varies as the cube of the speed. This means that increasing the speed of the pump has a significant effect on both head and power.

 Quick Tip

Understanding pump laws helps in selecting and operating centrifugal pumps efficiently.

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-type impellers are classified based on their design as open, semi-enclosed, and enclosed impellers. Open impellers have blades that are attached to a central hub, while enclosed and semi-enclosed impellers are fully or partially enclosed by a casing. These designs impact the pump's performance and efficiency.

 Quick Tip

The classification of impellers affects their ability to handle different types of fluids and operating conditions in centrifugal pumps.

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 are caused by various factors such as friction and turbulence in the moving water, shock losses due to changes in momentum, leakage past the impeller, and mechanical friction within the pump components. All these factors contribute to energy loss, reducing the pump's efficiency.

 Quick Tip

Understanding head losses helps in designing efficient pumps and minimizing energy losses in fluid systems.

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 designed for applications requiring high flow rates (large capacities) at low heads. These pumps are typically used in drainage, irrigation, and other water transport systems.

 Quick Tip

Propeller pumps are most effective in applications where large volumes of water need to be moved with minimal increase in pressure.

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 the terrace?

- (a) 80m

- (b) 800m
- (c) 8m
- (d) 10m

Correct Answer: (c) 8m.

Solution: To calculate the width of the terrace, use the formula:

$$\text{Width of terrace} = \frac{\text{Vertical interval}}{\text{Slope}} = \frac{2 \text{ m}}{0.25} = 8 \text{ m}$$

This gives the width of the terrace as 8 meters for a 25

 Quick Tip

Terraces help reduce soil erosion by controlling runoff and providing flat areas for cultivation on slopes.

24. The cross-sectional area of a waterway is calculated using the formula:

- (a) $a = (V \cdot Q)$
- (b) $a = \frac{Q}{V}$
- (c) $a = (Q \cdot V) = 100$
- (d) $a = \frac{V}{Q} \times 100$

Correct Answer: (b) $a = \frac{Q}{V}$.

Solution: The cross-sectional area a of a waterway can be calculated using the formula $a = \frac{Q}{V}$, where Q is the discharge (flow rate) and V is the velocity of the flow. This gives the area required to accommodate the flow at the given velocity.

 Quick Tip

Understanding waterway cross-sections is essential for designing efficient drainage systems and flood control measures.

25. Match List I with List II:

LIST I	LIST II
A. Farm forestry	I. Fruit trees with fruit crops
B. Silvipastoral system	II. Trees with crops
C. Agri-silviculture	III. Trees planted along the boundaries of agricultural fields
D. Agri-horticulture	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) - (III), (B) - (IV), (C) - (II), (D) - (I)
- (d) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

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

Solution: - Farm forestry involves trees planted along the boundaries of agricultural fields (III). - Silvopastoral systems involve grasses and trees (IV). - Agri-silviculture involves trees with crops (II). - Agri-horticulture involves fruit trees with fruit crops (I).

This classification helps in understanding various sustainable land management systems that integrate trees and crops to improve productivity and ecological balance.

 Quick Tip

These systems are crucial for improving biodiversity, increasing carbon sequestration, and enhancing food security.

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: The quantity of soil moved during wind erosion is influenced by factors like particle size, the gradation of particles, wind velocity patterns, and the distance over which the wind carries the soil. All these factors contribute to the overall amount of soil displaced.

 Quick Tip

Wind erosion is a complex process that requires understanding of various environmental factors to mitigate its impact on soil.

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: Sand dunes can be stabilized using natural regeneration of vegetation, artificial creation of vegetation, and the use of chemicals. These methods prevent further movement of sand and help restore ecological balance.

 Quick Tip

Vegetation plays a crucial role in stabilizing sand dunes by reducing wind speed and binding the sand particles together.

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 by dividing the delivered flow by the pumped flow:

$$\text{Efficiency} = \frac{\text{Delivered flow}}{\text{Pumped flow}} \times 100 = \frac{30}{40} \times 100 = 75\%$$

Thus, the conveyance efficiency is 75%.

 Quick Tip

High conveyance efficiency indicates minimal water loss during transport, which is essential for sustainable water management.

29. Irrigation requirement (IR) over a growing season by the crop is calculated

using the formula:

(a) $IR = (ET - Pe)(1 + LR)] \cdot Ea$

(b) $IR = (ET - Pe)(LR)] \cdot Ea$

(c) $IR = (Pe - ET)(1 + LR)] \cdot Ea$

(d) $IR = (Pe - ET)(LR)] \cdot Ea$

Correct Answer: (a) $IR = (ET - Pe)(1 + LR)] \cdot Ea$.

Solution: Irrigation requirement (IR) is determined by considering the seasonal evapotranspiration (ET), effective rainfall (Pe), leaching requirement (LR), and application efficiency (Ea). The formula accounts for the crop's need for water and adjusts for the efficiency of water application.

 Quick Tip

Calculating irrigation requirement helps in optimizing water use and ensuring adequate moisture for crop growth.

30. Match List I with List II:

LIST I	LIST II
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 is typically irrigated during the panicle initiation and flowering stages (II). - Wheat is irrigated during crown root initiation, jointing, and milking stages (IV). - Sorghum requires irrigation during seedling and flowering stages (III). - Maize is irrigated during silking and tasseling stages (I).

 Quick Tip

Matching irrigation schedules with crop growth stages ensures optimal water usage and crop health.

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:

- 1. (A), (C) and (D) only
- 2. (A), (B) and (D) only
- 3. (B), (C) and (D) only
- 4. (A), (B), (C) and (D)

Correct Answer: 4. (A), (B), (C) and (D).

Solution: Irrigation scheduling can be based on various approaches such as soil moisture depletion, plant indices, climatological data, and critical growth stages of crops. These approaches help in optimizing irrigation water use based on crop needs and environmental conditions.

 Quick Tip

Effective irrigation scheduling maximizes water use efficiency and supports sustainable agriculture practices.

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

- 1. Prismatic
- 2. Platy
- 3. Blocky
- 4. Granular

Correct Answer: 2. Platy.

Solution: Soils with a platy structure have poor drainage because the layers of soil particles are arranged in a compact, plate-like manner, which reduces permeability and restricts water flow.

 Quick Tip

Platy soils require soil structure improvement to enhance water infiltration and root growth.

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

1. 1 hour
2. 2 hours
3. 24 hours
4. 30 minutes

Correct Answer: 3. 24 hours.

Solution: The drainage coefficient is defined as the depth of water drained off from a given area in 24 hours. It is used to evaluate the drainage capacity of soil and determine the effectiveness of drainage systems.

 Quick Tip

The drainage coefficient helps in designing efficient drainage systems by indicating how much water can be removed from the soil in a specified time period.

34. Drains are designed to lower and maintain the ground water 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: Drains are classified based on their position as random field ditches and parallel field ditches. These are designed to remove excess water from the field and improve soil conditions. Random and parallel field ditches are common in agricultural areas to manage waterlogging and enhance crop growth.

 Quick Tip

Proper drainage techniques, including random and parallel field ditches, help prevent waterlogging and improve soil aeration for crops.

35. Match List I with List II:

LIST I	LIST II
A. 1:1 slope ratio	I. Loose sandy loam
B. 15:1 slope ratio	II. Clay
C. 2:1 slope ratio	III. Silt loam
D. 3:1 slope ratio	IV. Sandy loam

Choose the correct answer from the options given below:

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

Solution: - 1:1 slope ratio is associated with loose sandy loam (I) since it is a very steep slope and loose soil is better able to withstand erosion at this angle. - 15:1 slope ratio is associated with clay (II) as it is more stable with a gentle slope. - 2:1 slope ratio is associated with sandy loam (IV), which is moderately stable and suitable for these conditions. - 3:1 slope ratio is associated with silt loam (III), as it is a relatively gentle slope, suitable for this soil type.

 Quick Tip

Proper matching of slope ratios and soil types is crucial for ensuring stability and preventing erosion in land management projects.

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 drainage system, parallel laterals enter the main line at an angle, resembling the shape of a herringbone pattern. This system is commonly used in agricultural fields to efficiently drain water from the soil.

 Quick Tip

The herringbone system is ideal for ensuring effective water drainage, especially in large agricultural fields.

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 describes the flow of a fluid through a porous medium, stating that the effective velocity of flow is directly proportional to the hydraulic gradient and the permeability of the medium.

 Quick Tip

Darcy's Law is fundamental in understanding groundwater flow and is widely used in hydrogeology.

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 for determining hydraulic conductivity was developed by Hooghoudt. This method involves the measurement of water flow through a borehole to estimate the permeability of the soil.

 Quick Tip

Hooghoudt's method is commonly used in hydrogeological studies to assess soil permeability for groundwater and drainage design.

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 is the level at which water stands in a well when there is no pumping. It represents the natural water table of the aquifer.

💡 Quick Tip

The static water level is a key factor in determining the efficiency and performance of well water systems.

40. Ratio of the saturated thickness of a 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 the ratio of the saturated thickness of a semi-pervious layer to the hydraulic conductivity, describing the resistance of the soil layer to water flow. It is an important parameter in determining how easily water can move through the soil.

💡 Quick Tip

Hydraulic resistance is key to understanding the ease of water flow in soils and its impact on groundwater flow.

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: A hydraulic pump operates by utilizing the energy from flowing water to raise water, without the need for an external power source. It relies on the force of water flow to operate.

💡 Quick Tip

Hydraulic pumps are used in applications where there is a continuous water source to power the pump.

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 determined by the product of hydraulic, volumetric, and mechanical efficiencies. These efficiencies collectively determine how effectively a pump transfers energy and moves water. Water conveyance efficiency, while important, is not typically included in the overall pump efficiency calculation.

 Quick Tip

Understanding these three efficiencies is crucial for optimizing pump performance and ensuring energy efficiency.

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 relationship between flow rate and pump efficiency is typically inverted 'U' shaped, meaning that efficiency increases to a maximum point and then decreases as the flow rate continues to increase.

 Quick Tip

Optimizing the pump's operating point can improve system efficiency and reduce energy consumption.

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 movement of water through the soil column, as it moves from the surface into the deeper layers of the soil, typically driven by gravity.

 Quick Tip

Percolation plays a crucial role in replenishing groundwater supplies and maintaining soil moisture for crops.

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 can be estimated using various methods, including energy balance and microclimatological methods, soil-water balance, meteorological data, and pan evaporation. All these methods provide valuable data for assessing water requirements in agriculture and hydrology.

 Quick Tip

Accurate evapotranspiration estimation is essential for effective water management in agricultural and environmental planning.

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 water held in the soil by capillary forces and is available to plants for uptake. It is the most accessible form of soil water for plants.

 Quick Tip

Capillary water is essential for plant growth, as it is readily available for absorption by plant roots.

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 volume of water in the soil's pores relative to the total volume of the pores. It indicates how saturated the soil is with water.

 Quick Tip

Degree of saturation is a key measure of soil moisture and plays a critical role in determining soil's ability to retain water for plant use.

48. Ground water 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) and (C) only
- (c) (B) and (C) only
- (d) (B), (C) and (D) only

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

Solution: Methods for groundwater exploration include test drilling, electric logging, and electrical resistivity. These methods provide information about the subsurface conditions and help identify potential groundwater sources.

 Quick Tip

These methods are essential for assessing groundwater availability and understanding subsurface conditions.

49. Match List I with List II:

LIST I	LIST II
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 is relevant for confined and semi-confined aquifers (II). - Hydraulic conductivity applies to all aquifers (IV). - Specific yield is important for unconfined aquifers (I). - Hydraulic resistance is associated with semi-confined aquifers (III).

 Quick Tip

Understanding these parameters is essential for effective groundwater management and aquifer design.

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 the volume of water that an aquifer releases or stores

per unit surface area of the aquifer per unit change in head. It reflects the capacity of the aquifer to store and release water.

 Quick Tip

The coefficient of storage is important for understanding the dynamics of groundwater storage in an aquifer.

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), (B), (D)
- (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 values generally increase as you go from clay to coarse sand, silt, and fine sand. Clay has the lowest specific yield, while coarse sand has the highest.

 Quick Tip

Soil texture affects the ability of the soil to store and release water. Understanding specific yield is important for groundwater management.

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 determined by the sum of the depth of the water table, storage depth, and the drawdown. The height of the well above the ground surface is not typically included in the total well depth calculation.

 Quick Tip

Understanding well depth is crucial for determining the proper design and installation of water wells.

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) and (C) and (D).

Solution: A battery of wells is used when a shallow water table, poor hydraulic characteristics of the aquifer, and the impracticality of installing medium or deep tube wells are present. This system helps optimize water extraction.

 Quick Tip

A battery of wells is particularly useful in areas with limited groundwater availability or where the aquifer is not very productive.

54. Match List I with List II:

LIST I	LIST II
A. Percussion drills	1. Drilling deep holes in unconsolidated formations
B. Rotary drills	2. Drilling in hard rock areas
C. Down-the-hole Hammer drills	3. Operating tool in up and down motion
D. Core drills	4. 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: - Drilling deep holes in unconsolidated formations is done using percussion drills (I).
 - Rotary drills are used for drilling in hard rock areas (II). - Down-the-hole operating tool in up and down motion is associated with hammer drills (III). - To obtain uncontaminated samples, core drills are used (IV).

 Quick Tip

Selecting the right type of drilling equipment is essential for achieving accurate and uncontaminated geological samples.

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 to 9. This ratio refers to the proportion of gravel used in water wells to prevent the migration of fine particles while allowing water to flow efficiently into the well.

 Quick Tip

A gravel pack ratio of 4-9 ensures effective filtration and prevents clogging of the well screen.

56. Match List I with List II:

LIST I	LIST II
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 is classified based on the source of energy (III). - Microwave remote sensing is classified based on spectral regions (IV). - Airborne remote sensing is based on the sensor platform (II). - Multispectral remote sensing is classified based on the number of spectral bands (I).

 Quick Tip

Classifying remote sensing methods based on their characteristics helps in selecting the right technique for specific applications.

57. Match List I with List II:

LIST I	LIST II
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) - (I), (D) - (II)

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

Solution: - Middle infrared is used to assess surface chemical composition and atmospheric chemical composition (IV). - Near infrared is valuable for studying land cover and biological properties (II). - Thermal infrared is used to measure surface heat capacity and surface temperature (I). - Microwave is useful for examining surface physical properties and atmospheric precipitation (III).

 Quick Tip

Remote sensing allows us to analyze different spectral regions to gather critical information about surface properties and the atmosphere.

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 sequence of increasing wavelengths is: visible (B), Near Infrared (D), thermal infrared (C), and microwave (A).

 Quick Tip

Understanding the sequence of spectral regions is essential for selecting the right remote sensing technique for specific applications.

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 color composite, red color is assigned to the near-infrared (NIR) band, which is strongly reflected by healthy vegetation, making it appear red in the composite image.

 Quick Tip

False color composites are useful for identifying vegetation and other land cover types by their specific spectral reflectance.

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 correct sequence of gully formation is: - Channel erosion happens first (C), as water erodes the channel. - Gully heads enlarge and the gully bed deepens (A). - Local vegetation begins to establish (B). - Finally, the gully stabilizes (D).

 Quick Tip

Understanding the stages of gully formation helps in developing erosion control measures and land management strategies.

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:

- 1. (A), (B), (C), (D)
- 2. (C), (A), (D), (B)
- 3. (B), (C), (A), (D)
- 4. (C), (D), (A), (B)

Correct Answer: 2. (C), (A), (D), (B).

Solution: The correct sequence of growth stages is: - Seed bed (C), followed by establishment (A), growing period (D), and stubble (B).

 Quick Tip

Understanding these stages is crucial for estimating the crop management factor in erosion prediction models.

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 maximum permissible velocity for earthen channels generally increases in the order of sand and silt (A), loam and sandy loam (C), clay loam (D), and clay (B).

 Quick Tip

Knowing the maximum permissible velocity for different soil types helps in designing erosion-resistant earthen channels.

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 accurate correlations are as follows: - Modified Blaney-Criddle method (A) corresponds to $ET_0 = c[P(0.46T + 8)]$ (III), focusing on temperature and daylight duration. - Radiation method (B) aligns with $ET_0 = c(W R_n)$ (I), emphasizing net radiation influenced by temperature and altitude. - Modified Penman method (C) is linked with $ET_0 = c(W R_n) + (1 - W)f(u)(e_a - e_d)$ (IV), incorporating radiation, wind function, and vapor pressure difference. - Pan Evaporation (D) relates to $ET_0 = K_p E_{pan}$ (II), based on pan evaporation coefficients.

Quick Tip

To effectively match evapotranspiration (ET) estimation methods with their equations, it's essential to understand the impact of environmental factors like radiation, temperature, wind, and evaporation dynamics on the equations.

64. Match the pressure types with their corresponding characteristics:

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

Choose the correct answer from the options given below:

- (A) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
 (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 pairings are: - Atmospheric pressure (A) is related to barometric pressure (II). - Absolute pressure (B) has absolute zero as the datum (III). - Gauge pressure (C) uses local atmospheric pressure as the datum (IV). - Vacuum pressure (D) signifies sub-atmospheric pressure (I).

 Quick Tip

Understanding the datum point and characteristics of each pressure type is crucial for proper categorization.

65. Match the hydrological theory with the corresponding law:

List I (Theory)	List II (Law)
(A) The 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 can be analogized to heat flow through a metal bar or electricity flow	(III) Pascal's Law
(D) Flow rate through a 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 associations are:

Intensity of pressure at a static point is universally equal (A) matches with Pascal's Law (III).

Terminal velocity's proportionality to sphere radius (B) corresponds to Stokes' Law (I).

Analogy of water flow through soil to other flows (C) aligns with Buckingham's Law (IV).

Flow rate dependency on head loss in porous media (D) pertains to Darcy's Law (II).

 Quick Tip

Linking theoretical hydrological concepts to specific laws can enhance understanding of fluid dynamics in environmental engineering.

66. Match the hydrological terms with their definitions:

List I (Terms)	List II (Definition)
(A) Summation Curve	(I) Average infiltration rate
(B) ϕ -Index	(II) S-hydrograph
(C) W-Index	(III) Rate of rainfall above which runoff equals rainfall 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 pairings are: - Summation Curve (A) is described by the S-hydrograph (II), representing cumulative runoff. - ϕ -Index (B) quantifies the rainfall rate necessary for runoff to match rainfall volume (III). - W-Index (C) is defined as the average infiltration rate (I), crucial for hydrological modeling. - Base flow (D) represents sub-surface runoff (IV), a key component of river flow during dry periods.

 Quick Tip

Familiarize with hydrological terms like ϕ -Index and W-Index to effectively model and predict water flow in different scenarios.

67. Match the hydrological formulas with their applications:

List I (Name)	List II (Application)
(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 an auger hole fills is directly proportional to the circumference of the hole and 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: Accurate matches are: Kirkham (A) relates to the pipe cavity method (IV), emphasizing volume calculations in drainage systems.

Hooghoudt's equation (B) pertains to the design discharge capacity of open ditches (III), useful for agricultural and urban drainage planning.

Cypress Creek formula (C) describes the rate of water filling an auger hole, useful in geotechnical investigations (I).

Wischmeier (D) corresponds to the soil loss equation (II), crucial for erosion control and land management.

Quick Tip

To apply hydrological formulas effectively, understand their primary use in engineering tasks such as drainage design, soil conservation, and site investigation.

68. Sequence the steps involved in digital satellite image processing:

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

Choose the correct order 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 optimal sequence for processing digital satellite images is:

Radiometric and geometric corrections (C): Initial adjustments to correct sensor and geometric errors.

Image enhancement (A): Improvements made to image quality for better visual analysis.

Image transformation (B): Application of specific algorithms for detailed image analysis.

Image classification (D): Final step to categorize images into various classes based on their characteristics.

 Quick Tip

A systematic approach to satellite image processing ensures the highest quality and accuracy in environmental and geographical analyses.

69. Arrange the milestones in India's space program chronologically:

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

Choose the correct chronological order 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 significant events in India's space program is:

Aryabhata (C): India's inaugural satellite, launched in 1975.

Bhaskara (A): An earth observation satellite, launched in 1979.

First SLV (B): The first successful launch of the Satellite Launch Vehicle in 1980.

Rohini (D): The first satellite put into orbit by an Indian-made rocket.

 Quick Tip

Remembering the chronological progression of India's space milestones can provide insights into the development and capabilities of its space technology.

70. Outline the steps for land use planning using 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 sequence 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 logical sequence for planning land use through remote sensing involves:

Processing of satellite data (C): Extracting initial geospatial data.

Digital elevation model (B): Analyzing topographical data to understand landform.

Identifying land based on slope and soil characteristics (D): Determining land suitability for various uses.

Land capability classes (A): Classifying land based on its potential for specific uses.

 Quick Tip

Effective land use planning with remote sensing depends on a structured approach to data collection and analysis, starting with broad data gathering and refining to specific land classifications.

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, the *inlet structure* (II) is used to manage and direct the water into the system effectively.

(B) *Gate stands* (I) are utilized to regulate the distribution of water across various pipeline branches, ensuring precise flow control.

(C) *Overflow stands* (IV) are essential on steep slopes to prevent the overflow and maintain a stable flow within the pipeline.

(D) *Float valve stands* (III) are crucial in semi-closed pipelines for maintaining consistent pres-

sure and preventing system overloads.

 Quick Tip

Understanding the specific functions of various water management structures allows for better planning and implementation of hydraulic systems.

Question 72. Arrange the surface types in increasing order of Manning's roughness coefficient (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: Manning's roughness coefficient, n , provides a measure of surface resistance to flow:

Smooth impervious surfaces (C) offer the least resistance, hence have the lowest n .

Cultivated row crops (B) have moderate resistance due to uneven surface and crop barriers.

Timberland with deep forest litter (D) presents significant resistance due to dense undergrowth and debris.

Pasture or average grass (A) typically exhibits the highest n because of its dense, irregular vegetation cover.

 Quick Tip

Remember, the rougher the surface, the higher the Manning's coefficient, reflecting increased resistance to fluid flow.

Question 73. Arrange the C factor values in the RUSLE equation for different land use types in decreasing order:

- (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 in the Revised Universal Soil Loss Equation (RUSLE) reflects the cover management factor, where:

Forests (A) have the highest C factor due to extensive natural vegetation that protects the soil.

Pastures (D) provide significant ground cover, reducing erosion but less effectively than forests.

Row crops (C) offer moderate protection depending on the cropping technique and seasonality.

Bare land (B) has the lowest C factor, indicating minimal protection against erosion.

 Quick Tip

The C factor increases with the effectiveness of vegetation cover in protecting the soil from erosion.

Question 74. Arrange the given crops by increasing value of their Delta, the total depth of irrigation required for maturity:

- (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 reflect the irrigation depth required by crops: **Maize** (C) requires the least amount of water compared to the others listed.

Wheat (B) has moderate water requirements.

Cotton (D) requires more water than wheat but less than sugarcane.

Sugarcane (A) has the highest Delta value, reflecting its high water demand over the growing season.

💡 Quick Tip

Delta values are crucial in agricultural planning, especially in regions with limited water resources, as they help allocate irrigation based on crop water demands.

Question 75. Define the type of well that naturally flows due to high aquifer pressure:

- (A) Artesian well
- (B) Semi-artesian well
- (C) Water tube well
- (D) Skimming well

Correct Answer: (A) Artesian well

Solution: An **artesian well** is a type of well where water, under pressure, naturally rises above the level of the aquifer without the need for a pump. This phenomenon occurs when the water-bearing aquifer is confined between impermeable layers of rock or clay, creating pressure that forces the water upwards.

💡 Quick Tip

Understanding the geological conditions that lead to the formation of artesian wells can be crucial for effective groundwater management and sustainable water use.