

CEH583-IRRIGATION AND WATER RESOURCES ENGINEERING

UNIT 1

Irrigation and Its Methods

1. Which of the following methods of applying water may be used on rolling land?

- a) Border flooding
- b) Check flooding
- c) Furrow flooding
- d) Free flooding

Answer: a) Border flooding

2. If the electrical conductivity of water is in between 250 to 750 micro mhos/cm at 25°C, then it is classified as

- a) Low salinity water
- b) Medium salinity water
- c) High salinity water
- d) Very high salinity water

Answer: b) Medium salinity water

3. Sodium Absorption Ratio (SAR) is defined as

- a) $Na^+ / \sqrt{(Ca^{++} + Mg^{++})}$
- b) $Na^+ / 2\sqrt{(Ca^{++} + Mg^{++})}$
- c) $Na^+ / \sqrt{[(Ca^{++} + Mg^{++})/2]}$
- d) $2Na^+ / \sqrt{(Ca^{++} + Mg^{++})}$

Answer: c) $Na^+ / \sqrt{[(Ca^{++} + Mg^{++})/2]}$

4. The value of Sodium Absorption Ratio for high sodium water lies between

- a) 0 to 10
- b) 10 to 18
- c) 18 to 26
- d) 26 to 34

Answer: c) 18 to 26

5. Optimum depth of kor watering for rice is

- a) 135 mm

- b) 165 mm
- c) 190 mm
- d) 215 mm

Answer: c) 190 mm

6. Irrigation water having the concentration of Na^+ , Ca^{2+} and Mg^{2+} as 20, 3 and 1 milliequivalent per litre respectively will be classified as

- a) Low sodium water
- b) Medium sodium water
- c) High sodium water
- d) Very high sodium water

Answer: b) Medium sodium water

7. The relation between duty D in hectares/cumec, depth of water Δ in metres and base period B in days is given by

- a) $\Delta = 1.98B/D$
- b) $\Delta = 8.64B/D$
- c) $\Delta = 5.68B/D$
- d) $\Delta = 8.64D/B$

Answer: b) $\Delta = 8.64B/D$

8. The duty is largest

- a) At the head of water course
- b) On the field
- c) At the head of a main canal
- d) Same at all places

Answer: b) On the field

9. The “outlet discharge factor” is the duty at the head of

- a) Main canal
- b) Branch canal
- c) Watercourse
- d) Distributory

Answer: c) Watercourse

10. The kor depth for rice is 190 mm and kor period is 14 days. The outlet factor for this will be

- a) 637 hectares/m³/sec
- b) 837 hectares/m³/sec
- c) 972 hectares/m³/sec
- d) 1172 hectares/m³/sec

Answer: a) 637 hectares/m³/sec

11. For supplying water to rabi crop, kharif crop and sugarcane, the channel is designed for a capacity equal to the greater of the water requirement of

- a) Rabi or kharif
- b) Rabi and kharif or sugarcane
- c) Rabi and sugarcane or kharif and sugarcane
- d) Rabi or kharif or sugarcane

Answer: c) Rabi and sugarcane or kharif and sugarcane

12. The ratio of the quantity of water stored in the root zone of the crops to the quantity of water actually delivered in the field is known as

- a) Water conveyance efficiency
- b) Water application efficiency
- c) Water use efficiency
- d) None of the above

Answer: b) Water application efficiency

13. The water utilizable by plants is available in soils mainly in the form of

- a) Gravity water
- b) Capillary water
- c) Hygroscopic water
- d) Chemical water

Answer: b) Capillary water

14. The amount of irrigation water required to meet the evapotranspiration needs of the crop during its full growth is called

- a) Effective rainfall
- b) Consumptive use
- c) Consumptive irrigation requirement
- d) Net irrigation requirement

Answer: c) Consumptive irrigation requirement

15. With the increase in the quantity of water supplied, the yield of most crops

- a) Increases continuously
- b) Decreases continuously
- c) Increases up to a certain limit and then becomes constant
- d) Increases up to a certain limit and then decreases

Answer: d) Increases up to a certain limit and then decreases

16. Hydrograph is the graphical representation of

- a) Runoff and time
- b) Surface runoff and time
- c) Groundwater flow and time
- d) Rainfall and time

Answer: a) Runoff and time

17. Infiltration rate is always

- a) More than the infiltration capacity
- b) Less than the infiltration capacity
- c) Equal to or less than the infiltration capacity
- d) Equal to or more than the infiltration capacity

Answer: c) Equal to or less than the infiltration capacity

18. The depth of water required to bring the soil moisture content of a given soil up to its field capacity is called

- a) Hygroscopic water
- b) Equivalent moisture
- c) Soil moisture deficiency
- d) Pellicular water

Answer: c) Soil moisture deficiency.

19. Infiltration capacity

- a) Is a constant factor
- b) Changes with time
- c) Changes with location

d) Changes with both time and location

Answer: d) Changes with both time and location

20. Infiltration is the

a) Movement of water through the soil

b) Absorption of water by soil surface

c) Both (a) and (b)

d) None of the above

Answer: a) Movement of water through the soil

21. The unit hydrograph due to a storm may be obtained by dividing the ordinates of the direct runoff hydrograph by

a) Direct runoff volume

b) Period of storm

c) Total rainfall

d) None of the above

Answer: a) Direct runoff volume

22. The unit hydrograph of a specified duration can be used to evaluate the hydrograph of storms of

a) Same duration only

b) Same and shorter duration

c) Same and longer duration

d) Any duration

Answer: d) Any duration

23. S-hydrograph is used to obtain unit hydrograph of

a) Shorter duration from longer duration

b) Longer duration from shorter duration

c) Both (a) and (b)

d) None of the above

Answer: c) Both (a) and (b)

24. If two 4-hour unit hydrographs are staggered by 4 hours and added graphically, the resulting hydrograph will be

a) 4-hour unit hydrograph

b) 4-hour hydrograph with 20 mm runoff

- c) 8-hour unit hydrograph
- d) 8-hour hydrograph with 20 mm runoff

Answer: d) 8-hour hydrograph with 20 mm runoff

Match :

- 25.Drip Irrigation** - a. Prevents water wastage
- 26.Sprinkler Irrigation** - b. Water applied like rainfall
- 27.Irrigation** - c. Artificial application of water to crops

Answer: 1 – a, 2 – b, 3 – c

True or False :

28.Irrigation is the artificial application of water to agricultural crops.

Answer: True

29.Drip irrigation applies water to the crops in the form of rainfall.

Answer: False

(Sprinkler irrigation applies water like rainfall.)

30.Excessive irrigation may cause waterlogging and soil salinity.

Answer: True

UNIT 2

Soil Water Plant Relationship and Water Requirements of Crops

31.A multipurpose reservoir is the one which is

- a) Designed for one purpose but serves more than one purpose
- b) Planned and constructed to serve various purposes
- c) Both (a) and (b)
- d) None of the above

Answer: b) Planned and constructed to serve various purposes

32.The useful storage is the volume of water stored in the reservoir between

- a) Minimum pool level and maximum pool level
- b) Minimum pool level and normal pool level
- c) Normal pool level and maximum pool level
- d) River bed and minimum pool level

Answer: b) Minimum pool level and normal pool level

33.The water stored in the reservoir below the minimum pool level is called

- a) Useful storage
- b) Dead storage
- c) Valley storage
- d) Surcharge storage

Answer: b) Dead storage

34.For a flood control reservoir, the effective storage is equal to

- a) Useful storage – valley storage
- b) Useful storage + surcharge storage
- c) Useful storage + surcharge storage + valley storage
- d) Useful storage + surcharge storage – valley storage

Answer: d) Useful storage + surcharge storage – valley storage

35.Trap efficiency of a reservoir is a function of

- a) Capacity/inflow ratio
- b) Capacity/outflow ratio
- c) Outflow/inflow ratio
- d) None of the above

Answer: a) Capacity/inflow ratio

36.The total capacity of a reservoir is 25 million cubic metres and dead storage is 5 million cubic metres. If the average volume of sediment deposition is 0.10 million cubic metre per year, then the usefulness of the reservoir will start reducing after

- a) 50 years
- b) 150 years
- c) 200 years
- d) 250 years

Answer: a) 50 years

37.The forces, which are considered for the analysis of an elementary profile of a gravity dam under empty reservoir condition, are

- i) Water pressure
- ii) Self weight
- iii) Uplift

iv) Pressure due to earthquake

The correct answer is

- a) Only (ii)
- b) (i), (ii) and (iii)
- c) (i), (ii) and (iv)
- d) (i), (ii), (iii) and (iv)

Answer: a) Only (ii)

38. When the upstream face of a gravity dam is vertical, then the intensity of water pressure at the water surface and at the base respectively will be

- a) 0 and $wH^2/2$
- b) $wH^2/2$ and $wH^2/3$
- c) wH and 0
- d) 0 and wH

Where w is unit Weight of Water and H is the depth of Water

Answer: d) 0 and wH

39. The uplift pressure on a dam can be controlled by

- i) Constructing cutoff under upstream face
- ii) Constructing drainage channels between the dam and its foundation
- iii) By pressure grouting in foundation

The correct answer is

- a) Only (i)
- b) Both (i) and (ii)
- c) Both (i) and (iii)
- d) (i), (ii) and (iii)

Answer: d) (i), (ii) and (iii)

40. The uplift pressure on the face of a drainage gallery in a dam is taken as

- a) Hydrostatic pressure at toe
- b) Average of hydrostatic pressure at toe and heel
- c) Two-third of hydrostatic pressure at toe plus one-third of hydrostatic pressure at heel
- d) None of the above

Answer: c) Two-third of hydrostatic pressure at toe plus one-third of hydrostatic pressure at heel

41.Horizontal acceleration due to earthquake results in

- a) Hydrodynamic pressure
- b) Inertia force into the body of the dam
- c) Both (a) and (b)
- d) None of the above

Answer: c) Both (a) and (b)

42.Hydrodynamic pressure due to earthquake acts at a height of

- a) $3H/4\pi$ above the base
- b) $3H/4\pi$ below the water surface
- c) $4H/3\pi$ above the base
- d) $4H/3\pi$ below the water surface

Where H is the depth of water

Answer: a) $3H/4\pi$ above the base

43.The major resisting force in a gravity dam is

- a) Water pressure
- b) Wave pressure
- c) Self-weight of dam
- d) Uplift pressure

Answer: c) Self-weight of dam

44.Total force due to wave action on a gravity dam acts at a height of

- a) $hw/2$ above the reservoir surface
- b) $5/4 hw$ above the reservoir surface
- c) $3/8 hw$ above the reservoir surface
- d) $2/3 hw$ above the reservoir surface

where hw is the height of wave.

Answer: c) $3/8 hw$ above the reservoir surface

45. When the reservoir is full, the maximum compressive force in a gravity dam is produced

- a) At the toe
- b) At the heel
- c) Within the middle third of base

d) At centre of base

Answer: a) At the toe

46.The maximum permissible eccentricity for no tension at the base of a gravity dam is

a) $B/2$

b) $B/3$

c) $B/4$

d) $B/6$

Answer: d) $B/6$

47.Presence of tail water in a gravity dam

i) Increases the principal stress

ii) Decreases the principal stress

iii) Increases the shear stress

iv) Decreases the shear stress

The correct answer is:

a) (i) and (iii)

b) (i) and (iv)

c) (ii) and (iii)

d) (ii) and (iv)

Answer: d) (ii) and (iv)

48.Neglecting the effect due to earthquake forces and tail water pressure, the principal stress in a gravity dam is given by

a) p_v

b) $p_v \sec^2\theta$

c) $p_v \tan^2\theta$

d) $p_v \tan \theta$

where p_v is vertical direct stress and θ is angle of downstream face of dam with the vertical.

Answer: b) $p_v \sec^2\theta$

49.The elementary profile of a dam is

a) A rectangle

b) A trapezoidal

- c) An equilateral triangle
- d) A right angled triangle

Answer: d) A right angled triangle

50. In the empty condition of reservoir and with the elementary profile of a dam, the vertical stress at heel and toe respectively are given by

- a) 0 and $W/2B$
- b) $W/2B$ and 0
- c) $2W/B$ and 0
- d) 0 and $2W/B$

where B is base width and W is self-weight of unit length of dam.

Answer: c) $2W/B$ and 0

51. As compared to crest of the normal portion of the weir, the crest of the undersluice portion of weir is kept at

- a) Lower level
- b) Higher level
- c) Same level
- d) Any of the above depending on the design

Answer: a) Lower level

52. Silt excluders are constructed on the

- a) River bed upstream of head regulator
- b) River bed downstream of head regulator
- c) Canal bed upstream of head regulator
- d) Canal bed downstream of head regulator

Answer: a) River bed upstream of head regulator

53. If h is the ordinate of hydraulic gradient line above the top of the floor and G is specific gravity of floor material, then the thickness of floor is given by the formula

- a) $h/(G + 1)$
- b) $(h - 1)/(G - 1)$
- c) $h/(G - 1)$
- d) $(h - 1)/G$

Answer: c) $h/(G - 1)$

54. According to Khosla's theory, the exit gradient in the absence of a downstream cutoff is

- a) 0
- b) Unity
- c) Infinity
- d) Very large

Answer: c) Infinity

Match :

- 55. Infiltration** - a. Water needed by crops
- 56. Duty** - b. Movement of water into soil
- 57. Consumptive Use** - c. Area irrigated by unit quantity of water

Answer: 1 – b, 2 – c, 3 – a

True or False :

58. Infiltration is the process by which water enters the soil surface.

Answer: True

59. Permanent wilting point is the condition where plants can easily recover after watering.

Answer: False

60. Evapo-transpiration is the combined loss of water through evaporation and transpiration.

Answer: True

UNIT 3

Hydrology and Ground Water

61. Garret's diagrams have been drawn for

- a) A semi-circular channel
- b) A trapezoidal channel with side slope $\frac{1}{2} H : 1 V$
- c) A trapezoidal channel with side slope $1 H : \frac{1}{2} V$
- d) Semi-elliptical channel

Answer: b) A trapezoidal channel with side slope $\frac{1}{2} H : 1 V$

62. Lacey's regime scour depth is given by

- a) $1.35 (q/f)^{1/3}$
- b) $1.35 (q^2/f)^{1/6}$

c) $1.35 (q^2/f)^{1/3}$

d) $1.35 (q/f)^{1/6}$

where q is discharge per unit width and f is silt factor.

Answer: c) $1.35 (q^2/f)^{1/3}$

63. According to Lacey's theory, the silt supporting eddies are generated from

- a) Bottom of channel only
- b) Sides of channel only
- c) Bottom as well as sides of channel
- d) None of the above

Answer: c) Bottom as well as sides of channel

64. According to Lacey, the bed slope is given

by

a) $f^4/3 / 3340Q^{1/2}$

b) $f^2/3 / 3340Q^{1/4}$

c) $f^5/3 / 3340Q^{1/6}$

d) $f^1/3 / 3340Q^{5/3}$

where f is silt factor and Q is discharge in cumecs.

Answer: c) $f^5/3 / 3340Q^{1/6}$

65. As per Lacey's theory, the silt factor is

- a) Directly proportional to average particle size
- b) Inversely proportional to average particle size
- c) Directly proportional to square root of average particle size
- d) Not related to average particle size

Answer: c) Directly proportional to square root of average particle size

66. As per Lacey's regime theory, the flow velocity is proportional

to

a) $(Qf^2)^{1/3}$

b) $(Qf^2)^{1/6}$

c) Q/f^2

d) $(Q/f^2)^{1/6}$

Answer: b) $(Qf^2)^{1/6}$

67. Wetted perimeter of a regime channel for a discharge of 64 cumecs as per Lacey's theory will be

- a) 19 m
- b) 38 m
- c) 57 m
- d) 76 m

Answer: b) 38 m

68. Which of the following canal structures is used to remove surplus water from an irrigation channel into a natural drain?

- a) Canal fall
- b) Canal outlet
- c) Canal escape
- d) Canal regulator

Answer: c) Canal escape

69. For a proportional outlet, the flexibility is

- a) Zero
- b) Between zero and 1
- c) 1
- d) Greater than 1

Answer: c) 1

70. The sensitivity of a rigid module is

- a) Zero
- b) Between zero and one
- c) 1
- d) Infinity

Answer: d) Infinity

71. Which of the following is a flexible outlet?

- a) Submerged pipe outlet
- b) Kennedy's gauge outlet
- c) Gibb's outlet
- d) None of the above

Answer: b) Kennedy's gauge outlet

72. A straight glacis type fall with a baffle platform and a baffle wall is called

- a) Vertical drop fall
- b) Glacis fall
- c) Montague type fall
- d) Inglis fall

Answer: d) Inglis fall

73. Which of the following types of falls use parabolic glacis for energy dissipation?

- a) Vertical drop fall
- b) Glacis fall
- c) Montague type fall
- d) Inglis fall

Answer: c) Montague type fall

74. In a Sarda type fall, rectangular crest is used for discharge upto

- a) 6 cumecs
- b) 10 cumecs
- c) 14 cumecs
- d) 20 cumecs

Answer: c) 14 cumecs

75. Which of the following can be used as a meter fall?

- a) Vertical drop fall
- b) Flumed glacis fall
- c) Unflumed glacis fall
- d) All of the above

Answer: a) Vertical drop fall

76. Vertical drop fall is satisfactory for a height upto

- a) 0.5 m
- b) 1.5 m
- c) 3.5 m
- d) 5.0 m

Answer: b) 1.5 m

77. Which of the following canal outlets maintains a constant discharge?

- a) Non-modular outlet
- b) Flexible outlet
- c) Rigid module
- d) None of the above

Answer: c) Rigid module

78. The ratio of rate of change of the discharge of an outlet to the rate of change of the discharge of distributary channel is called

- a) Proportionality
- b) Flexibility
- c) Setting
- d) Sensitivity

Answer: b) Flexibility

79. The drainage water intercepting the canal can be disposed of by passing the canal below the drainage in

- a) Aqueduct and siphon aqueduct
- b) Aqueduct and super passage
- c) Super passage and canal siphon
- d) Level crossing

Answer: c) Super passage and canal siphon

80. If the R.L.'s of canal bed level and high flood level of drainage are 212.0 m and 210.0 m respectively, then cross drainage work will be

- a) Aqueduct
- b) Superpassage
- c) Siphon
- d) Siphon aqueduct

Answer: a) Aqueduct

81. A runoff river plant

- a) Is a medium head scheme
- b) Generates power during peak hours
- c) Is suitable only on a perennial river
- d) Has no pondage at all

Answer: c) Is suitable only on a perennial river

82. The net head under which the turbine reaches its peak efficiency at synchronous speed is called

- a) Design head
- b) Rated head
- c) Gross head
- d) Operating head

Answer: a) Design head

83. The ratio of the average load to the installed capacity of the plant whose reserve capacity will be equal to

- a) Load factor
- b) Plant factor
- c) Utilisation factor
- d) Both (a) and (b)

Answer: d) Both (a) and (b)

84. A hydroelectric scheme operating under a head of 80 m will be classified as

- a) Low head scheme
- b) Medium head scheme
- c) High head scheme
- d) None of the above

Answer: c) High head scheme

Match :

- 85. Hydrological Cycle** - a. Ability of soil to transmit water
- 86. Permeability** - b. Continuous movement of water in nature
- 87. Aquifer** - c. Formation that stores and transmits groundwater

Answer: 1 – b, 2 – a, 3 – c

True or False :

88. A rain gauge is used to measure rainfall.

Answer: True

89. Porosity is the ability of soil to transmit water.

Answer: False

(Permeability is the ability to transmit water.)

90. A pumping test is used to determine the characteristics and yield of a well.

Answer: True

UNIT 4

Dams Spillways and Diversion Head Works

91. Interception losses are due to

- i) Evaporation
- ii) Transpiration
- iii) Stream flow The

correct answer is

- a) Only (i)
- b) (i) and (ii)
- c) (i) and (iii)
- d) (i), (ii) and (iii)

Answer: a) Only (i)

92. A 6 hours storm had 4 cm of rainfall and the resulting runoff was 2 cm. If ϕ index remains at the same value, the runoff due to 10 cm of rainfall in 12 hours in the catchment is

- a) 4.5 cm
- b) 6.0 cm
- c) 7.5 cm
- d) 9.0 cm

Answer: b) 6.0 cm

93. Which of the following methods is used to estimate flood discharge based on high water marks left over in the past?

- a) Slope-area method
- b) Area-velocity method
- c) Moving boat method
- d) Ultra-sonic method

Answer: a) Slope-area method

94. In the moving boat method of stream flow measurements, the following measurements are required:

- i) Velocity and direction of current meter
- ii) Speed of the boat
- iii) Depths and time interval between depth readings

The correct answer is

- a) (i) and (iii)
- b) (ii) and (iii)
- c) Only (ii)
- d) (i), (ii) and (iii)

Answer: a) (i) and (iii)

Match :

- 95. Spillway** - a. Controls entry of water into canal
- 96. Canal Head Regulator** - b. Passes excess flood water safely
- 97. Silt Ejector** - c. Removes silt from canal water

Answer: 1 – b, 2 – a, 3 – c

True or False :

98. A spillway is provided to safely discharge excess water from a reservoir.

Answer: True

99. A canal head regulator controls the entry of water into the canal.

Answer: True

100. A barrage has fixed solid walls without any gates for controlling water flow.

Answer: False

(A barrage generally has adjustable gates to control the flow.)

101. Instantaneous unit hydrograph is a hydrograph of

- i) Unit duration
- ii) Unit rainfall excess
- iii) Infinitely small duration
- iv) Infinitely small rainfall excess

The correct answer is

- a) (i) and (ii)
- b) (i) and (iv)
- c) (ii) and (iii)

d) (iii) and (iv)

Answer: c) (ii) and (iii)

102. For a catchment area of 120 km^2 , the equilibrium discharge in m^3/hour of an S-equilibrium discharge curve obtained by the summation of 6 hour unit hydrograph is

a) $0.2 \times 10^6 \text{ m}^3/\text{hour}$

b) $0.6 \times 10^6 \text{ m}^3/\text{hour}$

c) $2.4 \times 10^6 \text{ m}^3/\text{hour}$

d) $7.2 \times 10^6 \text{ m}^3/\text{hour}$

Answer: a) $0.2 \times 10^6 \text{ m}^3/\text{hour}$

103. A unit hydrograph has one unit of

a) Rainfall duration

b) Rainfall excess

c) Time base of direct runoff

d) Discharge

Answer: b) Rainfall excess

104. The peak of a 4 hour flood hydrograph is $240 \text{ m}^3/\text{sec}$. If the rainfall excess is 80 mm and the base flow, which is constant, is $40 \text{ m}^3/\text{sec}$, then the peak of 4-hours unit hydrograph is

a) $20 \text{ m}^3/\text{sec}$

b) $25 \text{ m}^3/\text{sec}$

c) $30 \text{ m}^3/\text{sec}$

d) $35 \text{ m}^3/\text{sec}$

Answer: b) $25 \text{ m}^3/\text{sec}$

105. A 4-hour direct runoff hydrograph of a catchman is triangular in shape with a time base of 100 hours and peak flow of $50 \text{ m}^3/\text{sec}$. The catchment area is 360 km^2 . The peak flow of this catchment area for a 4-hour unit hydrograph is

a) $10 \text{ m}^3/\text{sec}$

b) $20 \text{ m}^3/\text{sec}$

c) $25 \text{ m}^3/\text{sec}$

d) $50 \text{ m}^3/\text{sec}$

Answer: b) $20 \text{ m}^3/\text{sec}$

106. To estimate the magnitude of a flood with a return period of T years, Gumbel's distribution method requires the following data pertaining to annual flood series:

- i) Mean value
- ii) Standard deviation
- iii) Length of record
- iv) Coefficient of skew

The correct answer is

- a) (i) and (ii)
- b) (i), (ii) and (iii)
- c) (i), (ii) and (iv)
- d) (i), (ii), (iii) and (iv)

Answer: b) (i), (ii) and (iii)

107. For an annual flood series arranged in descending order of magnitude, the return for a magnitude listed at position period m in a total data N is

- a) $N/(m+1)$
- b) $m/(N+1)$
- c) m/N
- d) $(N+1)/m$

Answer: d) $(N+1)/m$

108. If the risk of a flood occurring in the next 10 years is accepted to 10%, then the return period for design should be

- a) $1 + (0.9)^{0.10}$
- b) $1 - (0.9)^{0.10}$
- c) $1/(1 - 0.9^{0.10})$
- d) $1/(1 + 0.9^{0.10})$

Answer: c) $1/(1 - 0.9^{0.10})$

109. Partial duration series is mostly used for

- a) Rainfall analysis
- b) Flood analysis
- c) Both (a) and (b)
- d) None of the above

Answer: a) Rainfall analysis

110. If storage, inflow rate and outflow rate are denoted by S, I and Q respectively, then the value of S in Muskingum method of flood routing is given by the expression

- a) $K(XI - XQ - Q)$
- b) $K(XI + XQ - Q)$
- c) $K(-XI + XQ + I)$
- d) $K(XI - XQ - O)$

where K and X are coefficients.

Answer: a) $K(XI - XQ - Q)$

111. The double mass analysis is adopted to

- a) Estimate the missing rainfall data
- b) Obtain intensities of rainfall at various durations
- c) Check the consistency of data
- d) Obtain the amount of storage needed to maintain a demand pattern

Answer: c) Check the consistency of data

112. Retrogression of downstream levels, generally considered in the design of weirs or barrages, is

- a) Higher at high flood stage than at low water levels
- b) Same at high flood stage and at low water levels
- c) Higher at low water levels stage than at high flood stage
- d) Independent of the stage of flow

Answer: c) Higher at low water levels stage than at high flood stage

113. Cross-regulators in main canals are provided to

- a) Regulate water supply in the off-taking channel
- b) Regulate water supply in the main channel
- c) Regulate excessive flood water
- d) Head up water for adequate supply into the off-taking channel

Answer: d) Head up water for adequate supply into the off-taking channel

114. For a barrage, the exit gradient is independent of

- a) The applied head of water
- b) The horizontal length of floor
- c) The depth of upstream cutoff
- d) The depth of downstream cutoff

Answer: c) The depth of upstream cutoff

Match :

115. Canal Lining - a. Allows excess canal water to escape

116. Canal Escape - b. Reduces seepage losses

117. Canal Fall - c. Reduces the elevation of canal bed

Answer: 1 – b, 2 – a, 3 – c

True or False :

118. Canal lining helps to reduce seepage losses from a canal.

Answer: True

119. Water logging occurs when the water table rises near the ground surface.

Answer: True

120. A canal escape is used to increase the water level in the canal during floods.

Answer: False

(A canal escape is used to discharge excess water from the canal.)

UNIT 5

Irrigation Channels Cross Drainage Works and Canal Regulation Works

121. The DAD (Depth Area Duration) analysis for a catchment would indicate that

- a) For a given storm, the maximum depth increases with area
- b) For a given area, the maximum average depth of rainfall increases with storm duration
- c) For a given area, the maximum average depth of rainfall decreases with storm duration
- d) None of the above

Answer: b) For a given area, the maximum average depth of rainfall increases with storm duration

122. Permanent wilting point is

- a) A characteristic of the plant
- b) A soil characteristic
- c) A soil characteristic modified by the crop
- d) Dependent on soil-water-plant-fertiliser interaction

Answer: b) A soil characteristic

123. Conjunctive use of water in a basin means

- a) Combined use of water for irrigation and for hydropower generation
- b) Combined use of surface and ground water resources

- c) Use of irrigation water for both rabi and kharif season
- d) Use of irrigation water by cooperative of farmers

Answer: b) Combined use of surface and ground water resources

124. The tractive force method of designing stable channels is applicable to channels

- i) In coarse non-cohesive material
 - ii) In cohesive material
 - iii) Carrying clear water
 - iv) Carrying water containing suspended load
- Of these statements:
- a) (i) and (iii) are correct
 - b) (ii) and (iii) are correct
 - c) (i) and (iv) are correct
 - d) (ii) and (iv) are correct

Answer: a) (i) and (iii) are correct

125. As per Shield's criteria for the initiation of bed motion, the entrainment function is a unique function of

- a) Reynolds number
- b) Shear Reynolds number
- c) Froude number
- d) Both (b) and (c)

Answer: b) Shear Reynolds number

126. Rigid boundary canals, whose bed and banks are made with non-erodible materials, are in

- a) True regime
- b) Permanent regime
- c) Final regime
- d) None of the above

Answer: b) Permanent regime

127. In which of the following section a breast wall is usually provided?

- a) Main canal

- b) Under-sluice
- c) Head regulator
- d) Weir

Answer: c) Head regulator

128. The most ideal condition for energy dissipation for the design of spillways is when the tail water curve

- a) Lies above jump height curve at all discharges
- b) Coincides with jump height curve at all discharges
- c) Lies below the jump height curve at all discharges
- d) Lies above or below the jump height curve, depending upon the discharge

Answer: b) Coincides with jump height curve at all discharges

129. The ordinate of the Instantaneous Unit Hydrograph (IUH) of a catchment at any time t , is

- a) The slope of the 1-hour unit hydrograph at that time
- b) The slope of the direct runoff unit hydrograph at that time
- c) Difference in the slope of the S-curve and 1-hour unit hydrograph
- d) The slope of the S-curve with effective rainfall intensity of 1 cm/hr

Answer: d) The slope of the S-curve with effective rainfall intensity of 1 cm/hr

130. The leaching requirement of a soil is 10%. If the consumptive use requirement of the crop is 90 mm, then the depth of water required to be applied to the field is

- a) 80 mm
- b) 90 mm
- c) 100 mm
- d) 110 mm

Answer: c) 100 mm

131. Which of the following pairs are correctly matched?

1. Device to receive and eject drainage from canal — Inlet and outlet
 2. Cross-drainage canal structure when siphon canal bed level and drain bed level are same
 3. Cross-masonry work to facilitate road transport
- Select the correct answer using the codes given below:

- a) 1, 2 and 3
- b) 1 and 3

c) 2 and 3

d) 1 and 2

Answer: b) 1 and 3

132. The Sequent Peak algorithm is a method used in the estimation of the

a) Maximum possible precipitation in a basin

b) Maximum possible flood peak in a catchman

c) Minimum evapotranspiration from a catchman

d) Minimum reservoir capacity needed to meet a given demand

Answer: d) Minimum reservoir capacity needed to meet a given demand

133. If the design storm produces net rainfall depths of 4.6 cm and 3.5 cm in successive unit periods, and if the base flow is 2 m³/s, then the peak flood flow in m³/s will nearly be

a) 170 m³/s

b) 130 m³/s

c) 90 m³/s

d) 86 m³/s

Answer: b) 130 m³/s

134. A 4-hour rainfall in a catchment of 250 km² produces rainfall depths of 6.2 cm and 5.0 cm in successive 2-hour unit periods. Assuming the ϕ index of the soil to be 1.2 cm/hour, the run-off volume in ha-m will be

a) 16 ha-m

b) 22 ha-m

c) 1600 ha-m

d) 2200 ha-m

Answer: c) 1600 ha-m

135. A 3-hour unit hydrograph (UH) differs from a 6-hour UH, for any catchment, in that

a) Both the time of rise and the peak ordinate for the former are less than that for the latter

b) Both the time of rise and the peak ordinate for the former are greater than that of the latter

c) The time of rise is less but the peak ordinate is greater for the former as compared to that of the latter

d) The time of rise is greater but the peak ordinate is less for the former as compared to that of the latter

Answer: c) The time of rise is less but the peak ordinate is greater for the former as compared to that of the latter

136. As per the recommendations of the ISI (NBS), the shape of a lined canal is

- a) Trapezoidal
- b) Semicircular
- c) Parabolic
- d) Elliptic

Answer: a) Trapezoidal

137. Fig. 3.1 shows the curve of a hydrograph. Which of the following would cause the peak of the curve to shift to the right?

1. When the length of the overland flow is more.
2. When the slope of the land surface is less.
3. When the run-off is more.
4. When the rainfall is moderate.

Select the correct answer using the codes given below:

- a) 3 and 4
- b) 2 and 4
- c) 1 and 2
- d) 2, 3 and 4

Answer: c) 1 and 2

138. Match List I with List II and select the correct answer using the codes given below.

List I

- A. Land capability
- B. Sandy soil
- C. Consumptive use of a crop
- D. Water flow measurement

List II

1. Drip irrigation
2. Parshall flume
3. Contour strip cropping
4. Blaney-Criddle formula
5. U.S. Bureau of Reclamation Classification

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

Answer: a) A-5, B-1, C-4, D-2

139. A tropical cyclone in the northern hemisphere is a zone of

- a) Low pressure with clockwise wind
- b) Low pressure with anticlockwise wind
- c) High pressure with clockwise wind
- d) High pressure with anticlockwise wind

Answer: b) Low pressure with anticlockwise wind

140. If one wants to be 90% sure that the design flood in a dam project will not occur during the design life period of 100 years, the recurrence interval for such a flood would be

- a) About 90 years
- b) Equal to 100 years
- c) About 110 years
- d) Roughly 1000 years

Answer: d) Roughly 1000 years

141. The probable maximum flood is

- a) The standard project flood of an extremely large river
- b) A flood adopted in the design of all kinds of spillways
- c) A flood adopted in all hydraulic structures
- d) An extremely large but physically possible flood in the region

Answer: d) An extremely large but physically possible flood in the region

142. In a flow-mass curve study, the demand line drawn from a ridge does not intersect the mass curve again. This implies that

- a) the reservoir is not full at the beginning
- b) the storage is not adequate
- c) the demand cannot be met by the inflow as the reservoir will not refill
- d) the reservoir is wasting water by spill

Answer: c) the demand cannot be met by the inflow as the reservoir will not refill

143. The probable maximum precipitation at a station is

- a) The greatest rainfall for a given duration that is physically possible
- b) The rainfall of a given duration with maximum probability of occurrence
- c) The rainfall for a given duration that is impossible to occur
- d) None of the above

Answer: a) The greatest rainfall for a given duration that is physically possible

144. Consider the following statements:

1. A 100-year flood discharge is greater than a 50-year flood discharge.
2. 90% dependable flow is greater than 50% dependable flow.
3. Evaporation from salt-water surface is less than that from fresh-water surface.

Which of these statements are correct?

- a) 1 and 2
- b) 2 and 3
- c) 1 and 3
- d) 1, 2 and 3

Answer: a) 1 and 2

145. If a 4-hour unit hydrograph of a certain basin has a peak ordinate of $80 \text{ m}^3/\text{s}$, the peak ordinate of a 2-hour unit hydrograph for the same basin will be

- a) equal to $80 \text{ m}^3/\text{s}$
- b) greater than $80 \text{ m}^3/\text{s}$
- c) less than $80 \text{ m}^3/\text{s}$
- d) between $40 \text{ m}^3/\text{s}$ to $80 \text{ m}^3/\text{s}$

Answer: b) greater than $80 \text{ m}^3/\text{s}$

146. Match List I (Name of scientist) with List II (Contribution to field of hydrology) and select the correct answer using the codes given below the list:

List I

- A. Dalton
- B. Snyder
- C. Blaney-Criddle
- D. Sherman

List II

1. Unit hydrograph

2. Evaporation
3. Empirical flood formula
4. Synthetic unit hydrograph
5. Consumptive use equation

Codes:

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

Answer: c) A-2,B-4,C-5,D-1

147. A culvert is designed for a peak flow Q_p on the basis of rational formula. If a storm of the same intensity as used in the design and twice the duration occurs, then the resulting peak discharge will be

- a) Q_p
- b) $Q_p/2$
- c) $\sqrt{2} Q_p$
- d) $2 Q_p$

Answer: a) Q_p

148. Match List I with List II and select the correct answer using the codes given below the lists:

List I

- A. Specific yield
- B. Specific capacity
- C. Specific retention
- D. Specific storage

List II

1. Volume of water retained per unit
2. Volume of water drained by gravity per unit volume of aquifer
3. Difference of porosity and specific storage
4. Well yield per unit drawdown
5. Volume of water released from unit volume of aquifer for unit decline in piezometric head

Codes:

- a) A-2,B-4,C-1,D-5
- b) A-4,B-2,C-3,D-5
- c) A-2,B-5,C-1,D-4

d) A-4,B-2,C-3,D-1

Answer: a)A-2,B-4,C-1,D-5

149. Which method of irrigation supplies water directly to the root zone of the plant?

- a) Flooding
- b) Drip irrigation
- c) Sprinkler irrigation
- d) Basin flooding

Answer: b) Drip irrigation

150. Which structure is used to safely discharge excess water from a canal?

- a) Canal Fall
- b) Canal Escape
- c) Canal Outlet
- d) Cross Regulator

Answer: b) Canal Escape

UNIT 1

Irrigation and Its Methods

1. Define irrigation. Explain the necessity, benefits, ill-effects and types of irrigation
2. Explain the water resources in India and Command Area Development. Also discuss the impact of irrigation on environment?
3. Explain the different methods of surface irrigation with neat sketch?
4. Explain the methods of applying water to crops. Describe sub-surface irrigation, drip irrigation and sprinkler irrigation with their advantages and disadvantages?

UNIT 2

Soil Water Plant Relationship and Water Requirements of Crops

5. A crop has a base period of 120 days and requires a total depth of water of 90 cm during its base period.

Calculate:

- a) Duty of water at the field.
- b) Delta of water in metres.

- c) If the discharge available at the canal head is $4 \text{ m}^3/\text{s}$, determine the area that can be irrigated.
- d) Assume canal efficiency = 75%.

6. A canal system has a gross command area of 25,000 hectares. Out of this, 20% is unculturable. The cultivable command area is divided among three crops:

- Rice = 40%
- Wheat = 35%
- Sugarcane = 25%

The intensity of irrigation for rice, wheat and sugarcane is 80%, 60% and 50%, respectively.

Calculate:

- a) Gross command area.
- b) Cultivable command area.
- c) Area irrigated under each crop.
- d) Total irrigated area.
- e) Overall intensity of irrigation.

7. A crop requires a total consumptive use of 480 mm during its growing period of 120 days. Effective rainfall during this period is 120 mm.

The available soil can store 80 mm of readily available water in the root zone. Irrigation application efficiency is 75%.

Determine:

- a) Net irrigation requirement.
- b) Number of irrigations required.
- c) Depth of water to be applied during each irrigation.
- d) Approximate frequency of irrigation.
- e) Gross depth of irrigation water required.

8. Explain Command Area, Intensity of Irrigation, Cropping Pattern and Crop Rotation. Also describe the crops and crop seasons in India and methods of a1?

UNIT 3

Hydrology and Ground Water

9. Define Hydrology. Explain its applications in Civil Engineering and describe the Hydrological Cycle with a neat sketch?
10. Explain the different forms of precipitation and describe the measurement of rainfall using rain gauges. Explain the methods of finding mean rainfall over a drainage basin?
11. Explain runoff and its estimation. Describe the losses, hydrograph and unit hydrograph, and state the uses of unit hydrograph?
12. Explain groundwater resources and zones of groundwater. Describe aquifers and their types. Explain porosity, permeability, specific yield, specific retention and coefficient of storage. Also explain pumping test and recuperation test?

UNIT 4

Dams Spillways and Diversion Head Works

13. Explain the classification of dams. Compare Earthen Dam and Gravity Dam with their advantages and disadvantages?
14. Explain Gravity Dam with a neat typical cross-section. Describe its components, functions, types of failures and remedial measures?
15. Define Spillway. Explain its function, location and components. Describe the different types of spillways with neat sketches?
16. Explain Diversion Head Works with a neat layout. Describe the components and their functions. Explain Canal Head Regulator, Silt Excluder, Silt Ejector and Barrage. Also give the differences between weir and barrage?

UNIT 5

Irrigation Channels Cross Drainage Works and Canal Regulation Works

17. Explain the classification of canals. Describe the design of the most economical canal section with suitable equations and neat sketch?
18. Explain Kennedy's silt theory and Lacey's regime theory. Compare the two theories with their important equations?
19. Define canal lining. Explain the types, advantages and properties of good canal lining materials. Also explain water logging, its causes and remedial measures?

20. What are Cross Drainage Works (CD Works)? Explain the types of CD work with neat sketches. Also explain canal fall, canal escapes, cross regulator, distributary head regulator and canal outlet?

