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- **1.** Identify the correct sequence in a house water connection.
 - (A) Water meter, Gooseneck, Ferrule, Stopcock, Service pipe
 - (B) Water meter, Service pipe, Stopcock, Gooseneck, Ferrule
 - (C) Ferrule, Gooseneck, Service pipe, Stopcock, Water meter
 - (D) Ferrule, Water meter, Gooseneck, Service pipe, Stopcock
- 2. The mass curve method for determination of storage capacity of a reservoir uses
 - (A) census data and cash flow data
 - (B) cash flow data and water flow data
 - (C) water inflow data and water demand data
 - (D) water demand data and water wastage data
- **3.** Identify the wrong empirical formula name for computing the peak drainage discharge.
 - (A) Ven Te Chow formula
 - (B) Nawab Jung Bahadur formula

- (C) Dicken's formula
- (D) Ryve's formula

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4. Which of the following hydraulic formulae is **not** used for determining flow velocities in sewers and drains?

- (A) Horton's formula
- (B) Kutter's formula
- (C) Crimp and Burges' formula
- (D) All of the above
- 5. P. Trickling filter consists of a bed of crushed stone, gravel or slag of relatively large size.
 - Q. As sewage passes through the filtering media of the trickling filter, an organic film is formed around the particles of filtering media.

Identify the correct option.

- (A) P is correct and Q is incorrect
- (B) P is incorrect and Q is correct
- (C) Both are incorrect
- (D) Both are correct





- Identify the correct statement or statements from practical and technical point of view.
 - (A) In a two-chamber septic tank, the first chamber is a grit chamber and second chamber is anaerobic chamber.
 - (B) In a two-storied septic tank, the top storey is the grit chamber while the other is anaerobic chamber.
 - (C) Modern septic tanks possess a self-cleansing property.
 - (D) All are wrong statements
- 7. The elementary profile of a concrete gravity dam is
 - (A) right-angled triangle
 - (B) isosceles triangle
 - (C) equilateral triangle
 - (D) None of the above
- 8. What is a culvert?
 - (A) A bridge with span up to 8 m
 - (B) A bridge of span up to 6 m
 - (C) A bridge of span up to 3 m ·
 - (D) None of the above

9. P. A weir is a hydraulic structure where majority or the entire ponding is achieved by a raised crest and smaller part or nil part by the shutters.

- Q. A weir is a hydraulic structure that is made by constricting the width of the channel only.
- R. A barrage is a hydraulic structure that is made by creating a choking condition only.
- S. A barrage is a hydraulic structure where majority or the entire ponding is achieved by a shutter and smaller part or nil part by the raised crest.

Identify the correct statements in the above.

- (A) P and R
- (B) Q and S
- (C) Q and R
- (D) P and S
- Silt excluders are constructed ____ while silt ejectors are constructed ____.
 - (A) on the river bed, on the diversion headworks
 - (B) on the river bed, on the bed of the off taken canal
 - (C) on the bed of the off taken canal, on the bed of the river
 - (D) on the bed of the off taken canal, on the river bed

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- 11. Which of the following give a discharge that is relatively constant and fixed within limits?
 - (A) Non-modular modules
 - (B) Semi-modules
 - (C) Modular outlets
 - (D) None of the above
- 12. What are bed bars?
 - (A) They are iron rods placed on the bed of canal to ensure smooth flow in the canal
 - (B) They are small sediment island like deposits formed on the bed of the canal
 - (C) They are constructed, at suitable intervals, along an unlined canal so as to serve as permanent reference marks
 - (D) They are very large islands formed on the bed of rivers
- 13. Assuming 80% efficiency, 100 m³/sec of design discharge, and 100 m of design head, what will be the approximate electrical power produced?
 - (A) 800 megawatts
 - (B) 8000 kilowatts
 - (C) 8000000 watts
 - (D) None of the above

- P% of earth dam failures are due
 to hydraulic failures, Q% of the earth dam failures are due to seepage failures, R% of the earth dam failures are due to structural failures, where
 - (A) P = 40, Q = 33, R = 25
 - (B) P = 25, Q = 40, R = 33
 - (C) P = 33, Q = 25, R = 40
 - (D) P = 40, Q = 25, R = 33
- **15.** Select the correct statement from the following :
 - (A) The canal flows below the drain in aqueduct and syphon aqueduct, and the canal flows above the drain in super passage and syphon.
 - (B) The drain flows below the canal in aqueduct and syphon aqueduct, and the drain flows above the canal in super passage and syphon.
 - (C) It is engineer's choise to let the drain flow above or below the canal in aqueduct and syphon aqueduct and also in super passage and syphon.
 - (D) The above statements are wrong

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- 16. The flexibility of a module is defined as
 - (A) (outlet discharge)/ (distributary channel discharge)
 - (B) (depth of water in the distributary channel)/(head acting on the outlet)
 - (C) (depth of water in the distributary channel)^m/ (head acting on the outlet)ⁿ
 - (D) (rate of change of discharge of the outlet)/(rate of change of discharge of the distributary channel)
- 17. Lysimeters are used to measure
 - (A) groundwater recharge rates
 - (B) evapotranspiration
 - (C) interception losses
 - (D) lake evaporation
- 18. What are the lower and upper limits of catchment area for applicability of the use of unit-hydrograph?
 - (A) 200 ha and 5000 $\text{km}^2 \text{ s}$
 - (B) 2000 m^2 and 5000 km^2
 - (C) 200 ha and no upper limit

(D) None of the above

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19. Which of the following meters is used in river flow measurement?

- (A) Acoustic Doppler velocimeter
- (B) Electromagnetic velocimeter
- (C) Pygmy current meter
- (D) All of the above
- **20.** Which of the following is used for channel flow routing?
 - (A) Puls method
 - (B) Modified Puls method
 - (C) Goodrich method
 - (D) Muskingum method
- 21. Find the delta for a crop when its duty is 1728 hectares/cumec on the field, the base period for the crop is 240 days.



- (D) 60 cm
- 22. Blaney-Criddle formula is used for
 - (A) estimation of groundwater recharge
 - (B) reservoir evaporation
 - (C) Both of the above
 - (D) None of the above

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- 23. If the hydraulic radius of a river is 2 m and longitudinal bed slope of the channel is 0.0001, what will be the expected smallest size of the sediment particles on the bed of the river?
 - (A) About 4.5 mm
 - (B) About 2.36 mm
 - (C) 1.18 mm
 - (D) None of the above
- 24. A natural river is conveying a flow of 2500 cumec. What is the expected wetted perimeter of the river cross-section?
 - (A) 23.75 m
 - (B) 2375 m
 - (C) 237.5 m
 - (D) 327.5 m
- 25. The mathematical expression commonly used for spacing design of tile drainage system is called
 - (A) V. T. Chow equation
 - (B) Hooghoudt equation
 - (C) Horton equation
 - (D) R. J. Garde equation
- 26. Groundwater flow is analysed by using
 - (A) Darcy's law
 - (B) Reynolds' law
 - (C) Newton's law

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(D) Galerkin's principle

- 27. Given d_{mm} = average particle size in mm, Lacey's silt factor is calculated as
 - (A) $f = 1 \cdot 72 \sqrt{d_{mm}}$
 - (B) $f = 1.75\sqrt{d_{mm}}$
 - (C) $f = 1.77 \sqrt{d_{mm}}$
 - (D) None of the above
- 28. Armouring is defined as
 - (A) the process of strengthening the embankment of rivers
 - (B) the process of sand deposition on the river bed
 - (C) the process of bank erosion in rivers
 - (D) the process of transport of smaller size particles from the river bed surface leaving only the larger size particles during sediment transport
- **29.** A general mobile-boundary channel can be considered to have which of the following degrees of freedom?
 - (A) Depth of flow, bed width, side slope and longitudinal slope
 - (B) Depth of flow, bed width, side slope and planiform
 - (C) Depth of flow, bed width, longitudinal slope and planiform
 - (D) Depth of flow, bed width, planiform and sediment grading

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- 30. Identify the more correct statement.
 - (A) Alternate depth is related to specific energy equation and sequent depth is related to specific force equation.
 - (B) Alternate depth is related to specific force equation and sequent depth is related to specific energy equation.
 - (C) Alternate depth is related to total energy equation and sequent depth is related to total force equation.
 - (D) Alternate depth is related to total momentum equation and sequent depth is related to total energy equation.
- 31. Identify the correct statement.
 - (A) At critical flow through a channel section, the specific energy is minimum and the specific force is minimum for a given discharge.
 - (B) At critical flow through a channel section, the alternate depths merge to a single value but the sequent depths differ.
 - (C) At critical flow through a channel section, any surface disturbance wave always propagates in both upstream and downstream directions.
 - (D) At critical flow through a channel section, the specific force is equal to the specific energy.

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- **32.** What is the qualification of uniform flow?
 - (A) Slope of the energy line ≠ slope of the water surface = slope of the channel bed
 - (B) Slope of the energy line = ∞ and slope of the water surface = slope of the channel bed
 - (C) Slope of the energy line = slope of the water surface = slope of the channel bed = ± a constant
 - (D) Slope of the energy line = slope of the water surface = slope of the channel bed
- **33.** For an open rectangular channel, the Froude number at critical flow is

(A) 0

(B) 0·5

- (C) 1·0
- (D) None of the above

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- 34. A rectangular open channel having bed width 2 m is laid at a bed slope – 0.0009 and carries a flow of 10 cumec. What is its normal depth of flow?
 - (A) It needs a calculator for doing the calculations and hence one cannot answer it now
 - (B) Many data are missing in the problem statement
 - (C) The problem statement is wrong
 - (D) The uniform flow does not exist for the channel
- 35. The equation relating the preand post-hydraulic jump flow depths for rectangular channel is given by

(A)
$$\frac{y_1}{y_2} = \frac{-1 + \sqrt{1 + 8Fr_1^2}}{2}$$

(B) $\frac{y_1}{y_1} = \frac{+1 + \sqrt{1 + 8Fr_1^2}}{2}$

$$\frac{y_2}{y_2} = -----$$

(C)
$$\frac{y_2}{y_1} = \frac{+1 + \sqrt{1 + 8Fr_1^2}}{2}$$

(D)
$$\frac{y_2}{y_1} = \frac{-1 + \sqrt{1 + 8Fr_1^2}}{2}$$

Assume standard nomenclature of the terms used above.

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- 36. The most popular form of gradually varied flow equation is expressed as
 - (A) $\frac{dy}{dx} = \frac{S_0 S_f}{1 \alpha E r^2}$
 - (B) $\frac{dy}{dx} = \frac{S_f S_0}{1 \alpha F r^2}$

(C)
$$\frac{dx}{dy} = \frac{S_0 - S_f}{1 + \alpha F r^2}$$

(D)
$$\frac{dx}{dy} = \frac{S_0 - S_f}{1 - \alpha F r^2}$$

Assume standard nomenclature of the terms used above.

37. Equation for critical flow by using usual terms is given by

(A)
$$\frac{Q^2 T}{g A^3} = 1$$
 (B) $\frac{Q^2 T}{g P^3} = 1$

$$\frac{Q^2 P}{gA^3} = 1$$
 (D) $\frac{Q^2 T}{gD^3} = 1$

38. economic The most crosssection is the one

(C)

- (A) having minimum velocity for a given cross-section
- (B) having minimum wetted perimeter for a given flow cross-sectional area
- (C) Both of the above
- (D) None of the above





- **39.** Width of carriageway recommended by the IRC for two-lane road with raised kerbs is
 - (A) 7·0 m
 - (₿) 7·25 m
 - (C) 7·5 m
 - (D) 7·75 m
- 40. While aligning a road in a hilly area with a ruling gradient of 6.5%, a horizontal curve of radius 60 m is encountered. Find the compensated gradient at the curve.
 - (A) 5%
 - (B) 5·25%
 - (C) 1·5%
 - (D) 1·25%
- **41.** What is the PCU value of a bullock cart as per recommendation made by IRC?
 - (A) 7·0
 - (B) 8·0
 - (C) 3·0
 - (D) 4·0

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42. One passage of an overloaded vehicle with 3 times the standard load will cause damage equivalent to N passages of the standard load. Here N =

- (A) 81
- (B) 18
- (C) 36
- (D) 63

43. When a circular load of radius a with uniform pressure p is applied in the surface of a homogeneous layer, the vertical stress σ_z under the centre of the load at depth z is given by

(A)
$$\sigma_z = p \left[1 - \frac{z^2}{(a^3 + z^3)^{2/3}} \right]$$

(B) $\sigma_z = p \left[1 - \frac{z^3}{(a^2 + z^2)^{3/2}} \right]$

(C)
$$\sigma_z = p \left[1 - \frac{z^{1 \cdot 5}}{(a^2 + z^2)^{3/4}} \right]$$

(D)
$$\sigma_z = p \left[1 - \frac{z^2}{(a^2 + z^2)} \right]$$

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- 44. 1. Basic capacity
 - 2. Possible capacity
 - 3. Traffic flow
 - R. It is the maximum number of vehicles that can pass a given point on a lane or roadway during one hour under prevailing roadway and traffic conditions.
 - S. It is the number of vehicles moving in a specified direction on a given lane or roadway that passes a given point or cross-section during specified unit of time.
 - T. It is the maximum number of passenger cars that can pass a given point on a lane or roadway during one hour under nearly ideal roadway and traffic conditions which can possibly be attained.

Select the correct combination :

- (A) 1—T, 2—S, 3—R.
- (B) 1-R, 2-T, 3-S.
- (C) 1-T, 2-R, 3-S.
- (D) 1-R, 2-S, 3-T.
- **45.** The following gives the penetration grades of bitumen binder and corresponding equivalent viscosity grades. Select the correct option :

Penetration grades				
of bitumen binder	(A)	(B)	(C)	(D)
I. 80–100	a. VG-10	a. VG-80	a. VG-100	a. VG-90
II. 70–80	b. VG-20	b. VG-70	b. VG-80	b. VG-75
III. 60–70	c. VG-30	c. VG-60	c. VG-70	c. VG-65
IV. 30–40	d. VG-40	d. VG-30	d. VG-40	d. VG-35

46. The aggregates used for construction of BM base course shall fulfil the following properties. Select the correct option :

Property	Options				
	(A)	(B)	(C)	(D)	
Loss Angeles abrasion value :	<40%	<30%	<40%	<40%	
Aggregate impact value :	<40%	<40%	<25%	<30%	
Combined flakiness and elongation index :	<30%	<30%	<10%	<40%	
Water absorption :	5% to 3%	0%	<1%	<2%	

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47. Given that P_s = saturation population, P_0 = population at the starting point, P = population at any time t from the starting point, K = constant, t = time in years after the starting point, the population at any time t from the starting point is computed according to the logistic curve model as

(A)
$$\log_e \left(\frac{P_s - P}{P}\right)$$

 $-\log_e \left(\frac{P_s - P_0}{P_0}\right) = -KP_s \cdot t$
 $(P_s - P)$

(B)
$$-\log_e\left(\frac{\frac{1}{P}}{P}\right)$$

 $+\log_e\left(\frac{P_s - P_0}{P_0}\right) = -KP_s \cdot 1$

(C)
$$\log_e \left(\frac{P_s - P}{P}\right)$$

 $-\log_e \left(\frac{P_s - P_0}{P_0}\right) = (KP_s)^t$

- (D) None of the above
- **48.** According to the Indian Standard Code of Practices, the minimum total domestic consumption for a town or a city with full flushing system should be taken in terms of litres per head per day (l/h/d) as
 - (A) 135 l/h/d
 - (B) 170 l/h/d
 - (C) 235 1/h/d
 - (D) 200 1/h/d

- **49.** All hand-operated pumps for lifting water from tube wells are
 - (A) handle pump
 - (B) piston pump
 - (C) cylinder pump
 - (D) reciprocating pump
- **50.** Identify the correct statement from the following :
 - (A) The uniformity coefficient value for a slow sand filter varies from 2.5 to 3.3 while that for a rapid gravity filter it varies from 1.3 to 1.7.
 - (B) The uniformity coefficient value for a slow sand filter varies from 1.8 to 2.5 while that for a rapid gravity filter it varies from 1.3 to 1.7.
 - (C) The uniformity coefficient value for a slow sand filter varies from 1.5 to 2.3 while that for a rapid gravity filter it varies from 1.1 to 1.4.
 - (D) The uniformity coefficient value for a slow sand filter varies from 1.8 to 2.5 while that for a rapid gravity filter it varies from 1.1 to 1.4.

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