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1. Number of links in a 30 metric chain is
a. 100
b. 150
c. 180
d. 200

2. For a well-conditioned triangle, no angle should be less than
a. 20°
b. 30°
c. 45°
d. 60°

3. The angle of intersection of the two plane mirrors of an optical square is
a. 30°
b. 45°
c. 60°
d. 90°

4. The horizontal angle between the two meridians and magnetic meridian at a place is called
a. azimuth
b. declination
c. local attraction
d. magnetic bearing

5. The process of turning the telescope about the vertical axis in horizontal plane is known as
a. transiting
b. reversing
c. plunging
d. swinging

6. Which of the following errors can be eliminated by taking mean of both face observations?
a. error due to imperfect graduations
b. error due to eccentricity of verniers
c. error due to imperfect adjustments of plate levels
d. error due to line of collimation not being perpendicular to horizontal axis

7. Refraction correction
a. completely eliminates curvature correction
b. partially eliminates curvature correction
c. adds to the curvature correction
d. has no effect on curvature correction

8. A series of closely spaced contour lines represents a
a. steep slope
b. gentle slope
c. uniform slope
d. plane surface

9. The two point problem and three point problems are methods of
a. resection
b. orientation
c. traversing
d. resection and orientation

10. The number of horizontal cross wires in a stadia diaphragm is
a. one
b. two
c. three
d. four

11. The tilt displacement in an aerial photograph is radial from
a. plumb point
b. isocentre point
c. principal point
d. nadir point

12. A 'level line' is a
a. horizontal line
b. line parallel to the mean spheriodal surface of earth
c. line passing through the centre of cross hairs and the centre of eye piece
d. line passing through the objective lens

13. Dumpy level is most suitable when
a. the instrument is to be shifted frequently
b. fly levelling is being done over long distance
c. many readings are to be taken from a single setting of the instrument
d. all of the above

14. Which of the following methods of plane table surveying is used to locate the position of an inaccessible point?
a. radiation
b. intersection
c. traversing
d. resection

15. For a tacheometer the additive and multiplying constants are respectively
a. 0 and 100
b. 100 and 0
c. 0 and 0
d. 100 and 100

16. The length of the long chord of a simple circular curve of radius R and angle of deflection A is
a. R cos (Δ/2)
b. 2R cos (Δ/2)
c. 2R sin (Δ/2)
d. R sin (Δ/2)

17. When the wind effect is not considered during flight planning, the result is a
a. crab
b. drift
c. mosaic
d. none of the above

18. In triangulation, the best shape of the triangle would be
a. equilateral
b. right angled isosceles triangle
c. isosceles with two base angles of 56° 14' each
d. isosceles with two base angles of 65° 14' each

19. The vertices of an astronomical triangle would include
a. zenith, pole and heavenly body
b. azimuth, zenith, pole
c. azimuth, pole and heavenly body
d. azimuth, zenith and heavenly body

20. Correction for pull is
a. $\frac{(P-P_o)\,l}{AE}$
b. $\frac{(P-P_o)\,A\times l}{E}$
c. $(P-P_o)EAl$
d. $\frac{(P-P_o)\,A}{lE}$

21. Reciprocal ranging is adopted when the following is encountered
a. a dense forest
b. a hillock
c. a river
d. a tall building

22. Isogonic lines are the lines having the same
a. elevation
b. bearing
c. declination
d. dip

23. Radiation plane table survey is best suited when
a. distances are long but accessible
b. distances are short but accessible
c. distances are long and inaccessible
d. distances are short but inaccessible

24. Line of collimation
a. is the same as line of sight
b. the line joining point of intersection of cross hairs and optical centre of object glass
c. the geometrical axis of the telescope
d. the line parallel to the bubble tube axis

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25. The very first reading taken is called
a. back sight
b. fore sight
c. intermediate sight
d. invert

26. "Cross-section" and "Longitudinal sectioning" is
a. simple levelling
b. differential levelling
c. profile levelling
d. check levelling

27. When the temperature rises, length of bubble
a. remains unaltered
b. decreases
c. increases
d. sometimes increases and sometimes decreases

28. By Rankine's method deflection angle δ=
a. $\frac{1718.88\ c}{R}$ degrees
b. $\frac{1817.9\ c}{R}$ degrees
c. $\mathbf{\frac{90\times c}{\pi R}}$ **degrees**
d. $\frac{\pi R}{90\times c}$ degrees

29. A freely floating needle slightly gets inclined to the horizontal anywhere except on the equator. It is called
a. declinator
b. dip
c. local attraction
d. secular variation

30. Anallatic lens is provided
a. between diaphragm and object glass
b. exactly at the line of intersection of vertical and horizontal axis
c. just before objective
d. between eye-piece and diaphragm

31. The angle subtended by a 20 m arc at the centre is (in metric system)
a. 1146/R
b. 5730/R
c. 573/R
d. 1718.88/R

32. If a liquid has greater cohesion than adhesion with the solid, then the liquid in the capillary tube will
a. rise with concave surface upward
b. rise with convex surface upward
c. depress with concave surface upward
d. depress with convex surface upward

33. A vertical triangular area with vertex downward and altitude '$\hbar$' has its base lying on the free surface of a liquid. The centre of pressure below the free surface is at a distance of
a. $\hbar/4$
b. $\hbar/3$
c. $\mathbf{\hbar/2}$
d. $2\hbar/3$

34. A floating body is said to be in a state of stable equilibrium
a) When its metacentre height is zero
b) When the metacentre is above the centre of gravity
c) When the metacentre is below the centre of gravity
d) Only when its centre of gravity is below its centre of buoyancy

35. A right circular cylinder open at the top filled with liquid and rotated about its vertical axis at such a speed that half the liquid spills out, then the pressure intensity at the centre of bottom is
a) zero
b) one- fourth its value when cylinder was full
c) one-half its value when cylinder was full

d) Cannot be predicted from the given data

36. Hot wire anemometer is used to measure
a) discharge
b) velocity of gas
c) pressure intensity of gas
c) pressure intensity of liquid

37. Which of the following has highest co-efficient of discharge?
a. sharp edged orifice
b. venturimeter
c. borda's mouthpiece running full
c) cipolletti weir

38. The shear stress distribution for a fluid following in between the parallel plates, both at rest, is
a) constant over the cross section
b) parabolic distribution across the section
c) zero at the mid plane and varies linearly with distance from mid plane
d. zero at plates and increases linearly to midpoint

39. In series-pipe problems
a. the head loss is same through each pipe
b. the discharge is same through each pipe
c. a trial solution is not necessary
d. the discharge through each pipe is added to obtain total discharge

40. The best hydraulic channel cross-section is the one which has a
a. minimum roughness coefficient
b. least cost
c. maximum area for a given flow
d. minimum wetted perimeter

41. The hydraulic jump always occurs from
a. below critical depth to above critical depth
b. above critical depth to below critical depth
c. below critical depth to above normal depth
d. above normal depth to below normal depth

42. For uniform flow in a channel
a. the total energy line, water surface and bottom of channel are all horizontal
b. the total energy line and water surface are horizontal but bottom of channel is inclined
c. the total energy line, hydraulic gradient line and bottom of channel are all parallel
d. water surface and bottom of channel are parallel to each other

43. If 'f' is the friction factor, then the chezy's coefficient is proportional to
a. f
b. √f
c. 1/f
d. 1/√f

44. The most common device for measuring discharge through channels is
a. venturi flume
b. current meter
c. pilot tube
d. all the above

45. Super critical flow can occur in a
a. channel with a mild slope
b. channel with a steep slope
c. a horizontal channel
d. all the above

46. A fluid is a substance that
a. is essentially incompressible
b. has a viscosity that always decreases with temperature
c. cannot remain at rest when subjected to a shearing stress
d. cannot be subjected to shear forces

47. The relation between surface tension (σ) and difference of pressure (Δp) between the inside and outside of a liquid droplet is given as
a. $\Delta p = \sigma/4d$
b. $\Delta p = \sigma/2d$
c. $\Delta p = 4\ \sigma/d$
d. $\Delta p = \sigma/d$

48. In which one of the following tests is the organic matter in the waste water used as food by micro-organism?
a. BOD
b. Most probable Number
c. COD
d. Chlorine Demand

49. The meta-centric height (GM) is given by
a. $GM = BG - \frac{I}{V}$
b. $GM = \frac{V}{I} - BG$
c. $GM = \frac{I}{V} - BG$
d. none of the above

50. Continuity equations can take the form
a. $A_1 V_1 = A_2 V_2$
b. $\rho_1 A_1 = \rho_2 A_2$
c. $\rho_1 A_1 V_1 = \rho_2 A_2 V_2$
d. $\rho_1 A_1 V_1 = \rho_2 A_2$

51. The ratio of the area of the jet of water at Vena-contracta to the area of orifice is known as
a. co-efficient of discharge
b. co-efficient of velocity
c. co-efficient of contraction
d. co-efficient of viscosity

52. What is the ratio of maximum shear stress to average shear stress for a circular section?
a.2
b. 2/3
c. 4/3
d. 3/4

53. The co-efficient of discharge (Cd) in terms of C_v and Cc is
a. $C_d = C_v/C_c$
b. $C_d = C_v \times C_c$
c. $C_d = C_c/ C_v$
d. none of the above

54. The maximum number of unknown forces that can be determined in a concurrent coplanar force system under equilibrium is
a. 2
b. 3
c. 6
d. 1

55. The discharge through a rectangular notch is given by
a. $Q = 2/3\ C_d \times L \times H^{5/2}$
b. $Q = 2/3\ C_d \times L \times H^{3/2}$
c. $Q = 2/3\ C_d \times L \times H^{5/2}$
d. $Q = 8/15\ C_d \times L \times H^{3/2}$

56. The loss of head due to sudden expansion of a pipe is given by
a. $h_L = \frac{V^1 - V_2\ ^2}{2g}$
b. $h_L = \frac{0.5\ V_1}{2g}$
c. $h_L = \frac{(V^1 - V_2)\ ^2}{2g}$
d. none of the above

57. Diameter of nozzle (d) for maximum power transmission is given by
a. $d = (\frac{D^4}{8fL})^{1/5}$
b. $d = (\frac{D^5}{8fL})^{1/5}$
c. $d = (\frac{D^5}{8fL})^{1/4}$
d. none of the above

58. The pressure rise (ρi) due to water hammer, when the valve is closed suddenly and pipe is assumed rigid, is equal to
a. v √k/ρ
b. v √kρ
c. v √ρ/k
d. √kρ

59. Froude's number (Fe) is given by
a. Fe = v √L/g
b. Fe = v √g/L
c. Fe = $\frac{V}{\sqrt{L.g}}$
d. none of the above

60. The critical depth (h_e) is given by
a. $(\frac{q^2}{g})^{1/2}$
b. $(\frac{q}{g})^{1/3}$
c. $(\frac{q^2}{g})^{1/3}$
d. $(\frac{q^2}{g})^{2/3}$

61. Jet ratio (m) is defined as the ratio of
a. diameter of the jet of water to diameter of pelton wheel.
b. velocity of vane to the velocity of jet of water
c. velocity of flow of the jet of water
d. diameter of pelton wheel to diameter of the jet of water

62. For a continuous slab of 3m×3.5m size, the minimum overall depth of slab to satisfy the vertical deflection limits is
a. 5 cm
b. 7.5 cm
c. 10 cm
d. 12 cm

63. For a rectangular channel, the critical depth (y_c) is given by
a. $y_c = \frac{q^2}{g}$
b. $y_c = (\frac{3q^2}{g})^{1/3}$
c. $y_c = (\frac{q^2}{g})$
d. $y_c = (\frac{q^2}{g})^{1/4}$

64. A cast iron pipe of 1 m diameter is required to withstand a 200 m head of water. If the limiting tensile stress of the pipe material is 20 MPa, then the thickness of the pipe will be
a. 25 mm
b. 50 mm
c. 75 mm
d. 100 mm

65. If the intensity of rainfall is more than the infiltration capacity of soil, then the infiltration rate will be
a. equal to rate of rainfall
b. equal to infiltration capacity
c. more than rate of rainfall
d. more than infiltration capacity

66. If allowable percentage error in the estimate of basic rainfall is E and coefficient of variation of rainfall is C_v, then the optimum number of rain gauges is given by
a. C_v /E
b. √C_v/E
c. $(Cv/E)^2$
d. $(C_v)^{3/2}$

67. 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

68. 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. $B/6$

69. The maximum possible height of a safe dam having an elementary profile is
a. $\frac{f}{w\sqrt{G+1}}$
b. $\frac{f}{w\sqrt{G}}$
c. $\frac{f}{w(G+1)}$
d. $\frac{f}{w\sqrt{G-1}}$

70. In case of non-availability of space due to topography, the most suitable spillway is
a. straight drop spillway
b. shaft spillway
c. chute spillway
d. ogee spillway

71. The main cause of meandering is
a. presence of an excessive bed slope in the river
b. degradation
c. the extra turbulence generated by the excess of river sediment during floods
d. none of the above

72. The ratio of rate of change of the discharge of an outlet to the rate of change of the discharge of distributing channel is called
a. proportionality
b. flexibility
c. setting
d. sensitivity

73. A hyetograph is a graphical representation of
a. rainfall intensity and time
b. rainfall depth and time
c. discharge and time
d. cumulative rainfall and time

74. Discharge per unit drawdown at a well is called
a. specific storage
b. specific yield
c. specific capacity
d. none of the above

75. Which one of the following constitutes the basic assumption of unit-hydrograph theory?
a. non-linear response and time invariance
b. non-linear time variance and linear response
c. linear response and linear time variance
d. time invariance and linear response

76. An isohyets is line joining points of
a. equal rainfall intensity
b. equal rainfall depth
c. equal evaporation
d. equal humidity

77. The Ryve's formula for maximum flood from a catchment of area A is given by
a. $Q= CA^{2/3}$
b. $Q= CA^{3/2}$
c. $Q= CA^{1/3}$
d. $Q= CA^{3/5}$

78. Which of the following has the maximum water application efficiency?
a. surface irrigation
b. lift irrigation
c. sprinkler irrigation
d. furrow irrigation

79. If B is the base period in days, D is the duty in hectares/cumec and Δ is the delta of the crop in m, the relation between them is given by
a. D= 8.64 BΔ
b. Δ= 8.65 BD
c. Δ= 0.864B/D
d. Δ= 8.64B/D

80. Hydraulic failures of earth dams account for
a. 40% of the total failures
b. 30% of the total failures
c. 50% of the total failures
d. 60% of the total failures

81. In ogee spillway the discharge is proportional to
a. $H^{1/2}$
b. $H^{3/5}$
c. $H^{3/2}$
d. $H^{2/3}$

82. The energy dissipated in a hydraulic jump with initial and sequent depth of y_1 and y_2 is given as
a. $\frac{(y_2 - y_1)^3}{y_1 y_2}$
b. $\frac{(y^2 - y^1)^3}{2y_1 y_2}$
c. $\frac{(y^2 - y^1)^3}{3y_1 y_2}$
d. $\frac{(y^2 - y^1)^3}{4y_1 y_2}$

83. Cross drainage works are not required when the canal is completely
a. a ridge canal
b. a contour canal
c. side slope canal
d. carrier canal

84. If Q is the discharge and f is the silt factor, the regime scour depth according to Lacey's theory is given by
a. R= $4.75\sqrt{Q}$
b. R= $135 \frac{Q^2}{f}$
c. R= 0.47 $\left(\frac{Q}{f}\right)^{1/3}$
d. R= 1.35 $\left(\frac{Q}{f}\right)^{2/3}$

85. The balanced depth of cutting of a canal is one in which
a. the volume of cutting is equal to the volume of embankment
b. the volume of cutting is less than the volume of embankment
c. there is no cutting but only embankment
d. there is only cutting and no embankment

86. Guide banks are provided
a. to train the flow of a river along a specific course
b. to confine the width of the river
c. to reduce the flood peak
d. none of the above

87. In the most efficient trapezoidal section, which of the following is true?
a. the top width is twice the length of sloping side
b. the hydraulic radius is half the depth of flow
c. the slope is half of regular hexagon
d. all the above

88. The difference between the level of the top of the bank and the F.S.L is known as
a. safe margin depths
b. berm
c. free board
d. none of the above

89. As compared to geometrical increase method of forecasting population, arithmetical increase method gives
a. lesser value
b. higher value
c. same value
d. accurate value

90. The most common cause of acidity in water is
a. carbon dioxide
b. oxygen
c. hydrogen
d. nitrogen

91. The maximum permissible limit for fluoride in drinking water is
a. 0.1 mg/litre
b. 1.5 mg/litre
c. 5 mg/litre
d. 10 mg/litre

92. On standard silica scale, the turbidity in drinking water should be limited to
a. 10 ppm
b. 20 ppm
c. 30 ppm
d. 50 ppm

93. The process in which the chlorination is done beyond the break point is known as
a. pre chlorination
b. post chlorination
c. super chlorination
d. break point chlorination

94. As compared to rapid sand filters, slow sand filters give
i) slower filtration rate
ii) higher filtration rate
iii) lesser efficiency in removal of bacteria
iv) higher efficiency in removal of bacteria
The correct answer is
a. (i) and (ii)
b. (ii) and (iii)
c. (i) and (iv)
d. (ii) and (iv)

95. Air binding phenomena in rapid sand filters occur due to
a. excessive negative head
b. mud ball formation
c. higher turbidity in the effluent
d. low temperature

96. The detention period and overflow rate respectively for plain sedimentation as compared to sedimentation with coagulation are generally
a. less and more
b. less and less
c. more and less
d. more and more

97. In lime-soda process
a. only carbonate hardness is removed
b. only non-carbonate hardness is removed
c. lime reduces the carbonate hardness and soda-ash removes the non-carbonate hardness
d. lime reduces the non-carbonate hardness and soda-ash removes the carbonate hardness

98. BOD test is standardized at
a. 10˚c and 10 day
b. 20˚c and 5 day
c. 37˚c and 3 day
d. 59˚c and 2 day

99. The type of valve which allows water to flow in one direction but prevents its flow in the reverse direction is
a. reflux valve
b. sluice valve
c. air relief valve
d. preserve relief valve

100. For a country like India, where rainfall is mainly confined to one season, the suitable sewerage system will be
a. separate system
b. combined system
c. partially combined system
d. partially separate system

101. The minimum and maximum diameters of sewers shall preferably be
a. 15 cm and 100 cm
b. 15 cm and 300 cm
c. 30 cm and 450 cm
d. 60 cm and 300 cm

102. The type of sewer which is suitable for both combined and separate system is
a. circular sewer
b. egg shaped sewer
c. horse –shoe type sewer
d. semi-elliptical sewer

103. The minimum dissolved oxygen which should always be present in water in order to save the aquatic life is
a. 1 ppm
b. 4 ppm
c. 10 ppm
d. 40 ppm

104. Composting and lagooning are the methods of
a. sludge digestion
b. sludge disposal
c. sedimentation
d. filtration

105. The spray tower can be used to control
a. gaseous pollutants only
b. particular pollutants only
c. both (a) and (b)
d. none of the above

106. Which one of the following solid waste disposal methods is ecologically most acceptable?
a. sanitary landfill
b. incineration
c. compositing
d. pyrolysis

107. Zero hardness of water is achieved by
a. using lime soda process
b. excess lime treatment
c. ion exchange method
d. using excess alum dosage

108. Aerosol is
a. carbon particles of microscopic size
b. dispersion of small solid or liquid particles in gaseous media
c. finely divided particles of ash
d. diffused liquid particles

109. Permissible colour for drinking water is not more than
a. 5 units
b. 10 units
c. 25 units
d. 50 units

110. Conductivity represents the concentration of the following in the water sample
a. total solids
b. dissolved solids
c. volatile solids
d. fixed solids

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111. The content of total solids in drinking water shall not be greater than
a. 50 mg/ℓ
b. 100 mg/ℓ
c. 500 mg/ℓ
d. 2000 mg/ℓ

112. The suitable layout of distribution system for a city with roads of rectangular pattern is
a. grid iron system
b. dead end system
c. ring system
d. radical system

113. One of the important elements responsible for eutrophication is
a. nitrates
b. phosphates
c. sulphates
d. chlorides

114. Kuichling's formula for fire demand is Q=
a. 3182 √p
b. 1136 [p/10+10]
c. 4640 √p (1 – 0.01 √p)
d. 5660 √p

115. Coagulant should be used for sedimentation when turbidity of raw water exceeds
a. 5 units
b.10 unit
c. 50 units
d. 100 units

116. One of the physical agents responsible for disinfection is
a. ultra violet rays
b. ozone
c. heat
d. lime

117. Pumping system is best suited when
a. fire accidents occur frequently
b. density of population is high and space available is less
c. source of water is at low level
d. power failures are more common

118. A manhole is provided
a. at every 500 m intervals
b. at every corner
c. when flow gets divided
d. when direction or grade changes

119. Sewage sickness is a sickness developed by
a. humans due to consumption of crops grown on sewage
b. plants because of harmful elements of sewage irrigation
c. land unable to accept any more loading of sewage
d. sewage itself due to pathogens within

120. A septic tank is a water tight tank where the following operational (s) take place
a. sedimentation
b. sedimentation + digestion (anaerobic)
c. digestion (aerobic)
d. decomposition of organic and inorganic matter by bacteria

121. Any trap should necessarily have
a. water seal
b. sewage or sullage
c. a bent shape
d. grating

122. When the degree of saturation is zero, the soil mass under consideration represents
a. one phase system
b. two place system with soil and air
c. two phase system with soil and water
d. three phase system

123. Stoke's law is valid only if the size of particle is
a. less than 0.0002 mm
b. greater than 0.2 mm
c. between 0.2 mm and 0.0002 mm
d. all the above

124. Which of the following is a measure of particle size range?
a. effective size
b. uniformity coefficient
c. coefficient of curvature
d. none of the above

125. According to Atterberg, the soil is said to be of medium plasticity if the plasticity index PI is
a. $0 < PI < 7$
b. $7 \leq PI \leq 17$
c. $17 < PI < 27$
d. $pi \geq 27$

126. At liquid limit, all soils possess
a. same shear strength of small magnitude
b. same shear strength of large magnitude
c. different shear strength of small magnitude
d. different shear strength of large magnitude

127. Dispersed type of soil structure is an arrangement comprising particles having
a. face to face or parallel orientation
b. edge to edge orientation
c. edge to face orientation
d. all the above

128. Which of the following methods is best suited for determination of permeability of coarse-grained soils?
a. constant head method
b. falling head method
c. both (a) and (b)
d. none of the above

129. Vertical stress on a vertical line at a constant radial distance from the axis of a vertical load
a. is same at all depth
b. increases with depth
c. first increase, attains a maximum value and then decreases
d. first decrease, attains a minimum value and the increases.

130. with the increase in the amount of compaction energy
a. optimum water content increases but maximum dry density decreases
b. optimum water content decreases but maximum dry density increases
c. both optimum water content and maximum dry density increase
d. both optimum water content and maximum dry density decrease.

131. The shear strength of a soil
a. is directly proportional to the angle of internal friction of the soil.
b. is inversely proportional to the angle of internal friction of the soil
c. decreases with increase in normal stress
d. decreases with decrease in normal stress.

132. In a tri-axial compression test when drainage is allowed during the first stage (i.e. application of cell pressure) only and not during the second stage (i.e. application of deviator stress at constant cell pressure), the test is known as
a. consolidated drained test
b. consolidated undrained test
c. unconsolidated drained test
d. unconsolidated undrained test

133. Sensitivity of a soil can be defined as
a. percentage of volume change of soil under saturated condition

b. ratio of compressive strength of unconfined undistributed soil to that of soil in a remoulded state
c. ratio of volume of voids to volume of solids
d. none of the above

134. Passive earth pressure in a soil mass is proportional to
a. $\tan^2(45^\circ + \phi/2)$
b. $\mu/1-\mu$
c. $\tan^2(45^\circ - \phi/2)$
d. $\cot^2(45^\circ + \phi/2)$

135. Two ISMC 400 are placed back to back at a spacing of 300 mm and carry an axial load of 160 KN. As per IS: 800 1984, its lacing system should be designed to resist a transverse shear of
a. 1.6 KN
b. 4.00 KN
c. 8 KN
d. 16.0 KN

136. According to Rankine's analysis, minimum depth of foundation is equal to
a. $\frac{q}{r}\left(\frac{1+\sin\phi}{1-\sin\phi}\right)^2$
b. $\frac{q}{r}\left(\frac{1-\sin\phi}{1+\sin\phi}\right)^2$
c. $\frac{q}{r}\left(\frac{1+\sin\phi}{1-\sin\phi}\right)$
d. $\frac{q}{r}\left(\frac{1-\sin\phi}{1+\sin\phi}\right)$

137. Negative skin friction on a pile
a. acts downward and increases the load carrying capacity of the pile
b. acts upward and increases the load carrying capacity of the pile
c. acts downward and reduces the load carrying capacity of the pile
d. acts upward and reduces the load carrying capacity of the pile

138. By using Sieve analysis, the particle size distribution curve
a. $\frac{D30}{D30 \times D10}$
b. $\frac{\sqrt{D30}}{D60 \times D10}$
c. $\frac{D30}{\sqrt{D60 \times D10}}$
d. $\frac{D^2 30}{D60 \times D10}$

139. By using Sieve analysis, the particle size distribution curve
a. Stoke's law
b. Archimedes principle
c. Darcy's Law
d. All of the above

140. Core-cutter method is used for
a. determining density of soil
b. obtaining samples for direct shear test
c. determining bearing capacity of soil
d. compacting soil

141. Relationship between void ratio e and porosity n is given by
a. e= n (1+n)
b. e= n (1+e)
c. e= n (1–e)
d. e= n (1+n)

142. The deflocculating agent which is used in the sedimentation analysis is
a. hydrochloric acid
b. hydrogen peroxide
c. sodium hexa meta phosphate
d. sodium chlorite

143. The composite correction to be applied for in a hydrometer reading is
a. $c = c_1 - c_m \pm c_d$
b. $c = c_t \pm c_m - c_d$
c. $c = c_m - c_d \pm c_t$
d. none

144. The maximum water content at which a reduction in water content does not cause a decrease in volume of soil mass is known as
a. liquid limit
b. plastic limit
c. shrinkage limit
d. ductile limit

145. The liquidity index is given as
a. $\frac{w-p.L.}{P.I.}$
b. $\frac{w+P.L.}{P.I.}$
c. $\frac{P.I.}{w-P.L.}$
d. $\frac{P.I.}{w+P.L.}$

146. Thixotropy of soils refers to
a. gain of strength of soil with passage of time after it has been remoulded
b. loss of strength of soil with passage of time after it had been remoulded
c. thickening of soil particles with water
d. none of the above

147. In most of the practical flow problems in soil mechanics, the flow is
a. laminar
b. turbulent
c. supersonic
d. subsonic

148. A saturated stiff clay has unit weight 2 gm/cm3 and an unconfined compressive strength 2 kg/cm2. The depth of the tension crack that would develop in this clay is
a. 2 m
b. 5 m
c. 10 m
d. 20 m

149. Quick sand is
a. pure silica sand
b. a condition in which cohesion is decreased quickly
c. a sand which can act as a quick filter
d. a condition in which cohesionless soil loses its shear strength due to the upward flow of water

150. A soil which is fully consolidated under the existing over burden pressure is known as
a. normally consolidated soil
b. over consolidated soil
c. under- consolidated soil
d. none of the above

151. Generally the SPT number is corrected for
a. dilatancy only
b. overburden pressure only
c. both for dilatancy and overburden pressure
d. none of the above

152. In Mohr's stress circle, the radius of circle when σ_1 and σ_3 are major principal stress and τ is the shear stress on these planes is
a. $\sqrt{\frac{\sigma^1-\sigma_3}{2}+\tau^2}$
b. $\frac{\sigma_1-\sigma_3}{2}+\tau$
c. $\sqrt{\frac{\sigma^1-\sigma_3}{2}+\tau}$
d. $\sqrt{(\frac{\sigma^1-\sigma^3}{2})^2+\tau^2}$

153. Shear strength of soil is determined by the equation
a. $c= s + \sigma \tan \phi$
b. $\sigma= c + s \tan \phi$
c. $\mathbf{s= c + \sigma \tan \phi}$
d. $s= \sigma + c \tan \phi$

154. In the active state the angle made by the failure plane with major principal plane which is horizontal is
a. $45 - \phi/2$
b. $45 + \phi/2$
c. 45
d. zero

155. When a weak plane exists above the toe, then the probable type of failure that can be expected for the stability of the slope is
a. slope failure
b. base failure
c. toe failure
d. transitional failure

156. If a tripod settles in the interval death elapses between taking a back sight reading and the following four sides reading, than the elevation of turning point of
a. Increase
b. Decrease
c. Not change
d. Either (a) or (b)

157. The sequence of four stages of survey in a highway alignment is
a. reconnaissance, map study, preliminary survey and detailed survey
b. map study, preliminary survey, reconnaissance and detailed survey
c. map study, reconnaissance, preliminary survey and detailed survey
d. preliminary survey, map study, reconnaissance and detailed survey

158. When the path travelled along the road surface is more than the circumferential movement of the wheels due to rotation, then it results in
a. slippery
b. skidding
c. turning
d. revolving

159. The desirable length of overtaking zone as per IRC recommendation is equal to
a. overtaking sight distance
b. two times the overtaking sight distance
c. three times the overtaking sight distance
d. five times the overtaking sight distance

160. Reaction time of a driver
a. increases with increase in speed
b. decreases with increase in speed
c. is same for all speeds
d. none of the above

161. As per IRC recommendations, the maximum limit of super elevation for mixed traffic in plain terrain is
a. 1 in 15
b. 1 in 12.5
c. 1 in 10
d. equal to camber

162. The terrain may be classified as rolling terrain if the cross slopes of land is
a. upto 10%
b. between 10% and 25%
c. between 25% and 60%
d. more than 60%

163. The equilibrium super elevation required to counteract the centrifugal forcefully is given by
a. $\frac{V^2}{27.5\,R}$
b. $\frac{V^2}{75\,R}$
c. $\frac{(0.75\,V)^2}{127\,R}$
d. $\frac{V^2}{127\,R}$

164. The maximum design gradient for vertical profile of a road is
a. ruling gradient
b. limiting gradient
c. exceptional gradient
d. minimum gradient

165. For highway geometric design purposes the speed used is
a. 15^{th} percentile
b. 50^{th} percentile
c. 85^{th} percentile
d. 98^{th} percentile

166. The diagram which shows the approximate path of vehicles and pedestrians involved in accidents is known as
a. spot maps
b. pie charts
c. condition diagram
d. collision diagram

167. The most efficient traffic signal system is
a. simultaneous system
b. alternate system
c. flexible progressive system
d. simple progressive system

168. The most economical lighting layout which is suitable for narrow roads is
a. single side lighting
b. staggered system
c. central lighting system
d. none of the above

169. In CBR test the value of CBR is calculated at
a. 2.5 mm penetration only
b. 5.0 mm penetration only
c. 7.5 mm penetration only
d. both 2.5 mm and 5.0 mm penetrations

170. The method of design of flexible pavement as recommended by IRC is
a. group index method
b. CBR method
c. Westergaard method
d. Benkelman beam method

171. The minimum design speed for hairpin bends in hill roads is taken as
a. 20 kmph
b. 30 kmph
c. 40 kmph
d. 50 kmph

172. In a bituminous pavement, alligator cracking is mainly due to
a. inadequate wearing course
b. inadequate thickness of sub-base course of pavement
c. use of excessive bituminous material
d. fatigue arising from repeated stress applications

173. Camber depends on
a. smoothness of base coarse
b. permeability of sub grade
c. amount of rainfall
d. grade of wearing coarse

174. Psychological widening is
a. $\frac{V^2}{9.5\,R}$
b. $\boldsymbol{\frac{V}{9.5\sqrt{R}}}$
c. $\frac{V}{9.8\,R}$
d. $\frac{V^2}{9.8\sqrt{R}}$

175. The first artificial course provided on a highway
a. sub grade
b. sub base
c. base course
d. base coat

176. An instrument used to measure roughness index is
a. enoscope
b. deflectometer
c. seismograph
d. bump integrator

177. Soil stabilizer is used for
a. improving properties of low cost roads
b. improving skid resistance of a surface
c. growing vegetation on the side slopes of embankment
d. flattening of slope providing drainage and prevention of rock slides

178. Seal coat is a layer of
a. cement concrete
b. coarse sand + bitumen
c. water repellent agent
d. adhesive to improve bond between aggregate

179. Longitudinal ruts are formed because of
a. iron wheeled traffic
b. combined iron wheeled and pneumatic traffic
c. heavy rainfall
d. heavy axle loads of vehicles

180. Equivalent single wheel load as per IRC is
a. 8160 kg
b. 4080 kg
c. 2040 kg
d. 1020 kg

181. The area of most acute vision of a driver is a cone of
a. 3°
b. 10°
c. 15°
d. 20°

182. A channelization island should have
a. small entry radius and large exit radius
b. large entry radius and small exit radius
c. equal radii for entry and exit
d. large entry and exit radii

183. A per IRC the maximum width of a vehicle is
a. 1.75 m
b. 2.20 m
c. 2.44 m
d. 3.12 m

184. The rail is designated by its
a. length
b. weight
c. cross-section
d. weight per unit length

185. Number of fish bolts per fish plate is
a. 2
b. 4
c. 5
d. 6

186. The slipping of driving wheels of locomotives on the rail surface causes
a. wheel burns
b. hogging of rails
c. scabbing of rails
d. corrugation of rails

187. Creep is the
a. longitudinal movement of rail
b. lateral movement of rails
c. vertical movement of rails
d. difference in level of two rails

188. Minimum composite sleeper index prescribed on Indian Railways for a track sleeper is
a. 552
b. 783
c. 1352
d. 1455

189. Switch angle is the angle between
a. the gauge face of the stock rail and tongue rail
b. the outer face of the stock rail and tongue rail
c. the gauge face of the stock rail and outer face of the tongue rail
d. the outer face of the stock rail and the gauge face of the tongue rail

190. If α is the angle of crossing then the number of crossing 'N' according to right angle method is given by
a. ½ cot $(\alpha/2)$
b. cot $(\alpha/2)$
c. cot (α)
d. ½ cosec $(\alpha/2)$

191. The correct relation between curve lead (CL), switch lead (SL) and lead of crossing (L) is given by
a. CL= L – SL
b. L= CL– SL
c. SL= L + CL
d. L= (CL+SL)/2

192. The distance through which the tongue rail moves laterally at the toe of the switch for movement of trains is called
a. flangeway clearance
b. heel divergence
c. throw of the switch
d. none of the above

193. In a shunting signal, if the red band is inclined at 45˚ it indicates
a. stop
b. proceed
c. proceed cautiously
d. none of the above

194. "Gauge" on Indian Railways is the
a. Minimum distance between running faces of the two inner rails
b. Distance between the running faces measured 14mm below the rail table
c. Distance between the running faces measured 15.88mm below the rail table
d. Distance between the running faces measure 16mm below the rail table.

195. The primary function of ballast is to
a. maintain the gauge
b. provide elasticity
c. conceal and make up irregularities of sleepers
d. prevent growth of vegetation on formation.

196. Treating of wooden sleepers with 66%. ASCU to prevent infection before seasoning is called
a. creosoting treatment
b. impregnation treatment
c. prophylactic treatment
d. bontton treatment

197. Maximum ruling gradient permitted in Indian railways in plains is
a. 1 in 50
b. 1 in 100
c. 1 in 150
d. 1 in 500

198. Safe speed on BG curve is V=
a. $4.4\sqrt{R-70}$ kmph
b. $3.6\sqrt{R-6}$ knph
c. $4.4\sqrt{R-60}$ kmph
d. $3.6\sqrt{R-20}$ kmph

199. The purpose of marshalling yard is to
a. receive goods trains and to reorient their destinations
b. receive and split the trains bound towards different destinations
c. receive, break, rearrange and dispatch the goods train
d. receive, unload and load the goods wagons bound to different destinations.

200. The best system of a railway high way crossing is
a. level crossing
b. road over rail track
c. road under rail track
d. both road over and road under bridges