CIVIL ENGINEERING

(PAPER–II)

1. Which one of the following statements is correct?
   a. Dynamic viscosity of water is nearly 50 times that of air
   b. Kinematic viscosity of water is 30 times that of air
   c. Water in soil is able to rise a considerable distance above the groundwater table due to viscosity
   d. Vapour pressure of a liquid is inversely proportional to the temperature

2. Which of the following fluids can be classified as non-Newtonian?
   1. Kerosene oil
   2. Diesel oil
   3. Human blood
   4. Toothpaste
   5. Water
   Select -the correct answer using the codes given below:
   a. 1 and2
   b. 3and,4
   c. 2 and 5
   d. 1 and 5

3. As the depth of immersion of a vertical plane surface increases, the location of centre of pressure•
   a. Falls closer to the centre of gravity of the area
   b. Moves away from the centre of gravity of the area
   c. Ultimately coincides with the centre of gravity of the area
   d. Falls much below the centre of gravity of the area

4. Consider the following statements related to buoyancy in fluid statics :
   1. Principle of buoyancy is applicable both to floating bodies and to. submerged bodies.
   2. Archimedes formulated the first theory of buoyancy.
   3. In analyzing buoyancy of a floating body it is assumed that the resultant vertical force passes through centre of pressure.
   4. In a free-body diagram of a floating body summation of all horizontal forces is taken as zero.
   Which of these statements are correct?
   a. 1, 3 and 4
   b. 1, 2 and 4
   c. 1, 2 and 3
   d. 2, 3 and 4

5. Consider the following statements related to concept of continuity equation and the concept of control volume in deriving the equation
   1. Continuity equation relates velocity component and density of the fluid t a point in a fluid flow.
   2. Continuity equation assumes that no void occurs in the fluid and fluid mass is neither created nor destroyed.
   3. The shape of control volume for deriving the equation of continuity is assumed to be a parallelepiped.
   4. For incompressible fluids the equation of continuity does not contain the viscosity terms.
   Which of these statements are correct?
   a. 1, 2, 3 and 4
   b. 1 and 2
   c. 2, 3 and 4
   d. 1 and 4

6. Match List 1 (Equation / Principle) with: List II (Property) and the select the correct answer :
   List I
   A. Energy equation
   B. Continuity equation
   C. Moment of momentum
   D. Impulse-momentum principle
   List II

1. Force on a moving vane
2. Lawn sprinkler
3. Pressure at a point in a pipeline
4. Flow at two sections of a tapering pipe

	A	B	C	D
a.	4	3	2	1
b.	3	4	1	2
c.	4	3	1	2
d.	3	4	2	1

7. When a body moves through still water at a constant velocity of 4.5 m/s, the velocity of water at 0.8 m ahead of the nose of the body is 3.0 m/s. What will be the difference in pressure between the nose and the point 0.8 m ahead of it?
   a. 875 N/m^2
   b. 1000 N/m^2
   c. 1125 N/m^2
   d. 1250 N/m^2

8. Which one of the following statements is not
   a. Cavitation forms where the local pressure drops up to the vapour pressure condition due to increase in local velocity
   b. Cavitation takes place in turbine blades, runners of pumps, spillways where local velocity increases considerably
   c. Cavitation may be prevented by maintaining the ambient pressure relatively higher at probable points of occurrence by raising their levels
   d. Boundaries likely to be affected by cavitation can be protected against pitting by covering. it with tough materials like stainless steel or rubber

9. The stream function for a two-dimensional flow is given by $\psi = 2xy$. The resultant velocity at a paint P (2, 3) is
   a. 8.45 units/s
   b. 7.21 units/s
   c. 6.44 units/s
   d. 5.18 units/s

10. Consider the following parameters related to fluid flow:
    1. Vorticity
    2. Velocity Potential
    3. Stream Function

Which of these parameters exist both in rotational and irrotational flows ?
   a. 1 and 2
   b. 2 and 3
   c. 1 and 3
   d. 1, 2 and 3

11. Match List I with List II and select the correct answer :
    List I
    A. The type of vortex flow in which no external torque rotates the fluid mass
    B. Flow of liquid inside the impeller of a centrifugal pump
    C. Free surface of forced vortex flow
    D. In forced vortex, the rise of liquid level at ends
    List II
    1. The fall of liquid axis of rotation
    2. Free vortex flow
    3. Parabolic
    4. Forced vortex flow

	A	B	C	D
a.	4	2	3	1
b.	2	4	3	1
c.	4	2	1	3
d.	2	4	1	3

12. A Cipolletti weir discharges water with the head of water over the crest being 250 mm. If the head due to velocity of approach is 0.01 m, what will be the excess percentage of flow, when corrected for velocity of approach as compared to when not so corrected ?
    a. 3.2%
    b. 4.2%
    c. 5.3%
    d. 6.3%

13. Consider the following statements related to a horizontal venturimetre :
    1. The velocity of flow in the main pipe is greater and the pressure is lesser than that at the throat section.
    2. The velocity of flow in the main pipe is lower and the pressure is larger than that at the throat section.
    3. The pressure difference between the main pipe and throat section is positive.

4. The pressure difference between the main pipe and throat section is negative.

Which of these statements are not correct ?

a. 1 and 4
b. 1 and 2
c. 2 and 4
d. 3 and 4

14. The distorted models used in the hydraulic studies are those which

a. Have exaggeration of the vertical scale and horizontal scale
b. Are not geometrically similar to the prototypes
c. Have same vertical and horizontal scale as that of the prototypes
d. Have same Froude Number as that for the prototypes

15. A thin smooth plate 1 m wide and 2 m long is towed water at a velocity of 2 m/s. Assuming that boundary laminar (kinematic viscosity $= 10^{-6}$ m^2/s), then drag sides of the plate is

a. 5.3 N
b. 26.6 N
c. 53 N
d. 72.5 N

16. Match List I with List Il and select the correct answer:

List I
A. Flow development
B. Pipe network
C. Water hammer
D. Friction loss

List II
1. Surge tank
2. Entrance length
3. Darcy-Weisbach equation
4. Hardy-Cross method

	A	B	C	D
a.	2	4	1	3
b.	4	2	3	1
c.	2	4	3	1
d.	4	2	1	3

17. Which one following conditions must be satisfied in the Hardy-Cross analysis of pipe network ?

a. Continuity principle demands that flow into a network junction is equal to the flow out of it
b. Momentum equation must be satisfied so that the force in each loop is balanced
c. Darcy-Weisbach head loss equation is to be used in computing head loss in elementary circuits. The equation is of the form $h_L = kQ_n$.
d. $\Sigma H_L = \Sigma KQ_n$ must be equated to zero. If not, a flow correction factor ΔQ is to be made for arriving at a solution.

18. Which one of the following phenomena in a pipe flow is termed as water hammer?

a. The sudden rise of pressure in a long pipe due to sudden closure of valve
b. The rise of a pressure in a pipe flow due to gradual closure of valve
c. The rise of negative pressure
d. The zero pressure in a pipe flow

19. The moment correction factor for a flow through open channel is given by

a. $\dfrac{1}{AV^2}\displaystyle\int_A v^2 dA$

b. $\dfrac{1}{AV}\displaystyle\int_A v^2 dA$

c. $\dfrac{1}{A}\displaystyle\int_A v^2 dA$

d. $\dfrac{1}{AV^2}\displaystyle\int_A v^2 dA$

20. The steps involved in the procedure of computing length of backwater curves are given below with usual notations :

1. Insert all ΔH values and average value of slope in the differential equation.
2. Assume a new depth of flow y for the other end of the reach and insert corresponding values of A, P, v, R, v^2/2g, H and S.
3. Determine or assume the initial conditions of depth, channel characteristics and discharge.
4. Compute average S value and the change in specific head ΔH.
5. Repeat the process for each reach adding resulting ΔL values to obtain

total required distance ΔL until the depth or distance desired is reached.

The correct sequence of these steps is

a. 1, 2, 3, 4, 5

b. 3, 1, 5, 2, 4

c. 3, 2, 4, 1, 5

d. 1, 4, 5, 2, 3

21. Consider the following statements which relates to different types of water surface profiles. Curve types conform to usual classifications y_c and y_0 (critical and normal depths)

1. Type-3 curves lie between y and y_0.

2. All curves where $y < cy_0$ are unaffected upstream from any disturbance.

3. All curves where $y > y_0$ are influenced by downstream disturbances.

4. All curves approaching the y_0 line approach it asymtotically except for C curve where $y = y_0$.

Which of these statements are correct ?

a. 1, 2, 3 and4

b. 1,3and4

c. 2, 3 and 4

d. 1 and 2

22. The approximate discharge over a 4 m long rectangular weir (with suppressed end contractions) with head over the crest as 0.36 m is

a. 4.2 litres/s

b. 2.4 m^3/s

c. 6.1 litres/s

d. 1.6 m^3/s

23. Flow duration curve is a plot of

a. Flow 'against its time of occurrence in chronological order

b. Flow in ascending order against percentage time in chronological order

c. Flow that equalled or exceeded against percentage time

d. Flow against duration of time for which it is sustained

24. Pondage in a hydropower station is defined as

a. Impounding of considerable amount of excess water during seasons of surplus flow

b. A regulating body of water in the form of relatively small amount of run-off to regulate flow variation in daily or weekly power requirements

c. Excess run-off to last for years

d. Excess run-off for a f hours only

25. The specific speed of a turbine under a head of 150 m to develop 200 HP while running at 300 r.p.m. is

a. 10 — 35

b. 35 — 60

c. 60 — 300

d. 300 — 1000

26. The moving average of annual precipitation record is carried out to determine

a. Trend

b. Annual mean

c. Extreme annual variation

d. Extreme seasonal variation

27. Match List I (Hydrological Terms) with List II (Relationship/Nature of Curve), and select the correct answer:

List I

A. Theissen Polygon

B. Mass Curve

C. Hyetograph

D. DAD curve

List II

1. Average depth of rainfall over an area

2. Relationship of rainfall intensity and time

3. Relationship of accumulated rainfall and time

4. Relationship of river run-off and time

5. Always a falling curve

	A	B	C	D
a.	1	3	2	5
b.	1	5	3	2
c.	4	3	2	5
d.	4	5	3	2

28. Match List I (Type of Precipitation) with List II (Principal Causes) and select the correct answer :

List I

A. Convective

B. Cyclonic

C. Frontal

D. Orographic

List II

1. Atmospheric disturbance
2. Mountain barrier
3. Pressure difference
4. Temperature difference
5. Warm and cold air masses

	A	B	C	D
a.	1	4	5	2
b.	4	3	5	2
c.	1	4	2	5
d.	4	3	2	5

29. Which one of the following characteristics describes a watershed system in system's parlance ?

   a. Linear

   b. Non-linear

   c. Linear and time-invariant

   d. Non-linear and time-variant

30. A 6-hour storm with hourly intensities of 7, 18, 25, 12, 10 and 3 mm per hour produced a run-off of 33 mm. Then the ϕ-index is

   a. 7 mm/h

   b. 3 mm/h

   c. 10 mm/h

   d. 8 mm/h

31. A catchment area of 90 hectares has a run-off coefficient of 0.4. A storm of duration larger than the time of concentration of the catchment and of intensity 4.5 cm/hr creates a peak discharge rate of

   a. 11.3 m^3/s

   b. 0.45 m^3/s

   c. 450 m^3/s

   d. 4.5 m^3/s

32. Consider the following statements:

   1. Time-area histogram method aims at developing an IUH.
   2. Isochrone is a line joining equal rainfall on a map.
   3. Linear reservoir is a reservoir having straight boundaries.
   4. Linear channel is a fictitious channel in which an inflow hydrograph passes through with only translation and no attenuation.

Which of these statements are correct ?

   a. 1, 2 and 3

   b. 1 and 4

   c. 2, 3 and 4

   d. 1, 2, 3 and 4

33. Match List I (Floods) with list II (Parameters) and select the correct answer:

   List I

   A. Standard Project Flood (SPF)

   B. Maximum Probable Flood (MPF)

   C. Design Flood

   D. Maximum Flood

   List II

   1. Includes catastrophic floods
   2. Includes floods of severe conditions
   3. Peak flow obtained from observed data
   4. Flood of desired recurrence interval

	A	B	C	D
a.	2	1	4	3
b.	1	2	3	4
c.	2	1	3	4
d.	1	2	4	3

34. Which of the following pairs are correctly matched?

   1. Silt factor : Average size of silt particles
   2. Silt load : Volume of suspended sediments flowing with water in unit time
   3. Silt charge : Weight of silt per unit volume of water
   4. Silt grade : Gradation between different silt particles

Select the correct answer using the codes given below

   a. 1 and 4

   b. 3 and 4

   c. 2 and 3

   d. 1 and 2

35. Consider the following statements

   The function of a cut-off in an earth dam is to

   1. Reduce uplift pressures on the dam
   2. Prevent undermining of foundation
   3. Reduce loss of stored water
   4. Support the dam

Which of these statements are correct ?

a. 1 and 3

b. 2 and 4

c. 2 and 3

d. 3 and 4

36. Match List I (Theory) with List II(Propounded By) and select the correct answer :

List I

A. Exit gradient

B. Alluvial canal

C. Unit hydrograph

D. Boundary layer

List II

1. G. Lacey

2. L. K. Sherman

3. A. N. Khosla

4. C. Inglis

5. T. V. Karman

6. L. Prandtl

	A	B	C	D
a.	1	3	2	6
b.	6	2	3	5
c.	3	1	2	6
d.	3	1	4	2

37. The ideal condition for energy dissipation in the design of spillways is the one when the tail water rating curve

a. Lies above jump rating curve at all discharges

b. Coincides with the jump rating curve at all discharges

c. Lies below jump rating curve at all discharges

d. Lies either above or below the jump rating curve depending upon discharge

38. The worst condition of uplift on the flood of a siphon aqueduct occurs when there is

a. High flood flow in the drainage with canal dry

b. Full supply flow in the canal with drainage dry

c. High flood flow in the drainage with canal running full

d. Water tube is at drainage bed and canal is dry

39. A check dam is a

a. Flood control structure

b. Soil conservation structure

c. River training structure

d. Water storage structure

40. Match List I (Well Hydraulics Parameters) with List II (Definition) and select the correct answer

List I

A. Specific yield

B. Safe yield

C. Specific capacity

D. Field capacity

List II

1. Discharge per unit drawdown of well

2. Same as specific retention

3. Measure of water that can be removed by pumping

4. Limit of withdrawal from well without depletion of the aquifer

5. Water-bearing capacity of aquifer

	A	B	C	D
a.	4	3	2	5
b.	3	4	1	2
c.	4	3	1	2
d.	3	4	2	5

41. Consider the following statements:

A well development

1. involves reversal of flow through the well screen

2. increases permeability towards the well

3. decreases permeability towards the well

4. is continued till sand/silt free water is pumped out

Which of these statements is/are correct?

a. 1, 3 and 4

b. 1, 2 and 4

c. 3 only

d. 1 and 4

42. Leaching s a process

a. By which alkali salts present in the soil are dissolved and drained away

b. By which alkali salts in soil come up with water

c. Of draining excess water of irrigation

d. Which controls waterlogging

43. On which of the following factors, does the population growth in a town normally depend?
    1. Birth and death rates
    2. Migrations
    3. Probabilistic growth
    4. Logistic growth
    Select the correct answer using the codes given below
    a. 1 and 4
    b. 1 and 2
    c. 1, 2 and 3
    d. 2 and 3

44. Match List t with List II and select the correct answer using the codes given below:
    List I(Tests)
    A. Pumping Test
    B. Recuperation
    C. Pressure Test
    D. Jar Test
    List II (Features)
    1. The gradual rise of water level in well is observed as time progresses
    2. Rate of pumping is adjusted to consent level of water in well
    3. Vigorous mixing of the chemical followed by slow mixing
    4. Pipeline is filled up with water, allowed to stand for sometime and then at least double the maximum pressure is applied

	A	B	C	D
a.	1	2	3	4
b.	2	1	4	3
c.	1	2	4	3
d.	2	1	3	4

45. The purpose of re-carbonation process of water softening is the
    a. Removal of excess soda from water
    b. Removal of non-carbonate hardness
    c. Recovery of lime
    d. Conversion of precipitates to soluble form

46. Which of the following treatment processes are necessary for removing suspended solids from water?
    1. Coagulation .
    2. Flocculation
    3. Sedimentation
    4. Disinfection
    Select the correct answer using the codes given below
    a. 1 and 2
    b. 1, 2 and 3
    c. 2 and 4
    d. 1 and 4

47. Match List I (Filter Operating Problems) with List (Effects) and select the correct answer:
    List I
    A. Air binding
    B. Mud deposition
    C. Cracking of bed
    D. Sand incrustation
    List II
    1. Changes effective size of sand
    2. Mud penetrates deeper inside the bed
    3. Mounds and balls of mud are formed in the bed
    4. Air and gases get locked in the bed

	A	B	C	D
a.	4	3	2	1
b.	3	4	1	2
c.	4	3	1	2
d.	3	4	2	1

48. Which of the following are removed by rapid sand filter from water?
    1. Dissoled solids
    2. Suspended solids
    3. Bacteria
    4. Helminths
    Select the correct answer using the codes given below:
    a. 1 and 2
    b. 2 and 3
    c. 1 and 3
    d. 2, 3 and 4

49. Consider the following valves in a water distribution system
    1. Check valve
    2. Pressure-reducing valve
    3. Air relief valve
    4. Scour valve

5. Sluice valve

Which of these work automatically ?

a. 1, 3 and 4

b. 2, 4 and 5

c. 3, 4 and 5

d. 1, 2 and 3

50. A sewer is commonly designed to attain self-cleansing velocity at

a. Peak hourly rate of flow

b. Average hourly rate of flow

c. Minimum hourly rate of flow

d. Sewer running half full

51. Sewage sickness signifies

a. Diseases caused by sewage

b. Soil pores getting dogged and preventing free circulation of air when sewage is continuously applied on land

c. Raw sewage is applied and used for irrigating vegetables which are eaten raw

d. Disposal of septic sewage on land

52. Consider the following data in the design of grit chamber:

1. Sp gravity of grit = 2.7

2. Size of grit particle = 0.21 mm

3. Viscosity of water $= 1.0 \times 10^{-2}$ cm^2/s

The setting velocity (cm/s) of the grit particle will be

a. 1 to 2.5

b. 2.6 to 5.0

c. 5.1 to 7.8

d. > 7.8

53. Amongst the various sewage treatment methods, for the same discharge, the largest area is needed for

a. Trickling Filter

b. Anaerobic Pond

c. Oxidation Ditch

d. Oxidation Pond

54. Consider the following treatment steps in a conventional wastewater treatment plant:

1. Primary sedimentation

2. Grit removal

3. Disinfection

4. Secondary sedimentation

5. Screening

6. Secondary treatment unit

The correct sequence of these steps is

a. 5,2,1,6,4,3

b. 1,2,4,5,3,6

c. 2, 3, 4, 5, 6, 1

d. 6, 5, 4, 3, 2, 1

55. In an activated sludge process, the sludge volume index can be controlled by

a. Aeration

b. Adding chlorine

c. Reducing recycling ratio

d. Increasing the depth of aeration tank

56. A primary sedimentation tank is not required for

a. Activated sludge system

b. Extended aeration system

c. Trickling filtration system

d. Tapered activated sludge process using pure oxygen for aeration

57. In urban air pollution, the most poisonous gas is supposed to be carbon monoxide. It is hazardous because

a. It affects our sense of smell

b. It is carcinogenic in nature

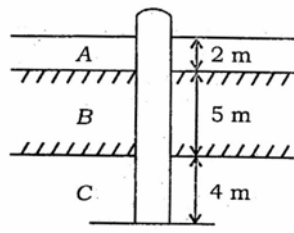c. it combines with haemoglobin

d. It causes blindness

58.
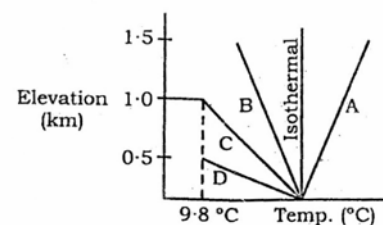
The above graph shows the relationship of ambient lapse rates to the dry adiabatic lapse rate under different conditions of stability. Match stability situations A, B, C and D (as given in the graph) with the classes of stability as follows

1. Superadiabatic

2. Dry adiabatic

3. Subadiabatic

4. Inversion

Select the correct answer using the codes given below

	A	B	C	D
a.	3	4	1	2
b.	4	3	2	1

c.   3   4   2   1

d.   4   3   1   2

59. The term Refuse' generally does not include
   a. Putrescible solid waste
   b. Excreta
   c. Non-putrescible solid waste
   d. Ashes

60. Bangalore method and Indore method of disposing solid wastes are
   a. Identical
   b. Different as Bangalore method is an anaerobic method
   c. Different as Bangalore method does not contain human excreta
   d. Different as Indore method is an incineration method

61. Which one of the following statements explains the term pyrolysis ?
   a. Solid waste is heated in closed containers in oxygen-free atmosphere
   b. Solid waste is incinerated in presence of oxygen
   c. Wastewater is treated with oxygen
   d. Dissolved solids from water are removed by glass distillation

62. The collapsible soil is associated with
   a. Dune sands
   b. Laterite soils
   c. Loess
   d. Black cotton soils

63. The predominant mineral responsible for shrinkage and swelling in black cotton soil is
   a. Illite
   b. Kaolinite
   c. Mica
   d. Montmorillonite

64. Consistency as applied to cohesive soils is an indicator of its
   a. Density
   b. Moisture content
   c. Shear strength
   d. Porosity

65. While computing the values of limits of consistency and consistency indices, it is found that liquidity index has a negative value.

Consider the following comments on this value:
   1. Liquidity index cannot have a negative value and should be taken as zero.
   2. Liquidity index can have a negative value.
   3. The soil tested is in semisolid state and stiff.
   4. The soil tested is in medium soft state.

Which of these statements are correct 7.
   a. 1 and 4
   b. 1 and 3
   c. 2 and 4
   d. 2 and 3

66. A stratified soil deposit has three layers of thicknesses: $Z_1 = 4$, $Z_2 = 1$, $Z_3 = 2$ units and the corresponding permabilities of $K_1 = 2$, $K_2 = 1$ and $K_3 = 4$ units, respectively.

The average permeability perpendicular to the bedding planes will be
   a. 4
   b. 2
   c. 8
   d. 16

67. Match List I (Soil Description) with List II (Coefficient of Permeability, mm/s) and select the correct answer :

List I
A. Gravel
B. Clay silt admixtures
C. Loess
D. Homogeneous clays

List II
1. > 1
2. 10^{-2} to 10^{-4}
3. $< 10^{-6}$
4. 10^{-4} to 10^{-6}

A B C D
   a. 4 1 3 2
   b. 1 4 3 2
   c. 4 1 2 3
   d. 1 4 2 3

68. In a compaction test if the compacting effort is increased, it will result in
   a. Increase in maximum dry density and OMC

b. Increase in maximum dry density but OMC remains unchanged

c. Increase in maximum dry density and decrease in OMG

d. No change iii maximum dry density but decrease in OMG

69. Consider the following statements :

A dispersed structure is formed in clay when

1. the net electrical forces between adjacent soil particles at the time of deposition are repulsive

2. remoulding and compacting of clays have high void ratio

3. there is concentration of dissolved minerals in water

4. platelets have face to face contact in more or less parallel arrays

Which of these statements are correct ?

a. 1, 2 and 3

b. 2, 3 and 4

c. 1, 2 and 4

d. 1, 3 and 4

70. A CD triaxial test was conducted on a granular soil. At failure σ'^1 / σ'^3 was 3.0. The effective minor principal stress of failure was 75 kPa. The principal stress difference at failure will be

a. 75 kPa

b. 150 kPa

c. 225 kPa

d. 300 kPa

71. 71. The ultimate bearing capacity of a square footing on surface of a saturated clay having unconfined compression strength of 50 kN/m^2 (using Skempton equation) is

a. 250 kN/m^2

b. 180 kN/m^2

c. 150 kN/m^2

d. 125 kN/m^2

72. If two foundations, one narrow and another wide, are resting on a bed of sand carrying the same intensity of load per unit area, then which one is likely to fail early?

a. Narrow foundation

b. Wider foundation

c. Both will fail simultaneously

d. Difficult to judge since other conditions are unknown

73. In a Newmark's chart for stress distribution, there are 10 concentric circles and 20 radial lines. The influence factor for the chart would be

a. 0.1

b. 0.05

c. 0.01

d. 0.005

74. The contact pressure distribution under a rigid footing on a cohesionless soil would be

a. Uniform throughout

b. Zero at centre and maximum at edges

c. Zero at edges and maximum at centre

d. Maximum at edges and minimum at centre

75.

Skin frictional capacities of a 40 cm diameter driven concrete pile for the portions A, B and C are 17 kN, 63 kN and 503 kN respectively, and point load capacity is 11000 RN/rn2 Total pile load capacity will be

a. 3743 kN

b. 2864 RN

c. 1965 RN

d. 1529 RN

76. Sinking effort in well foundation is the ratio of weight of well steining to that of skin friction developed on the sides and should preferably be

a. < 1.0

b. = 1.0

c. > 1.2

d. > 2.0

77. Consider the following statements

1. All soils can experience liquefaction under vibrations.

2. Liquefaction is generally associated with sandy soils.

3. Liquefaction is not possible in normal clays.

4. Highly sensitive clays may undergo liquefaction under vibrations.

Which of these statements are correct ?

a. 1 and 3
b. 2 and 4
c. 2 and 3
d. 2, 3 and 4

78. On which o the following factors does the behaviour of sand mass to cause liquefaction during an earthquake depend largely?

1. The number of stress cycles
2. The frequency and amplitude of vibrations of the earthquake shock
3. Angle of internal friction of sand
4. Relative density of sand

Select the correct answer using the codes given below :

a. 1, 2, 3 and 4
b. 2, 3 and 4
c. 1 and 3
d. 4 only

79. Match List I (Sampler) with List II (Use) and select the correct answer :

List I

A. Split spoon sampler
B. Stationary piston sampler
C. Rotary sampler
D. Compressed air sampler

List II

1. To obtain representative samples in all types of soil
2. To obtain undisturbed samples of sands below water table
3. To obtain undisturbed samples in clay and silts
4. To obtain approximately undisturbed samples of hard cemented cohesive soils

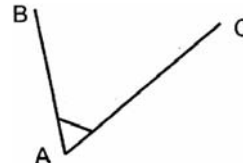|	A	B	C	D
a.	1	3	2	4
b.	3	1	4	2
c.	1	3	4	2
d.	3	1	2	4

80. Which one of the following figures indicates the principle of traversing ?
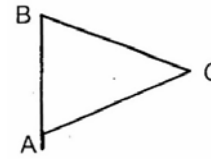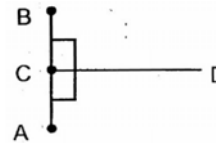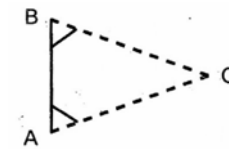

81. The magnetic needle in a prismatic compass is placed

a. At the bottom of the graduated aluminium ring
b. Above the graduated aluminium ring
c. Below the brass box
d. Below the needle lifter, but above the bottom inside the compass

82. From the probability equation it is found that the most probable values of a series of errors arising out of observations of equal weightage are those for which the sum of their squares is

a. Zero
b. Infinity
c. Minimum
d. Maximum

83. Match List I (Terms) with List II (Description) and select the correct answer:

List I

A. Contour
B. Line of collimation
C. Tie line
D. Magnetic meridian

List II

1. Line joining magnetic North and South

2. Line joining subsidiary station on the main line
3. Line joining points of same elevation
4. Line joining optical centre of the objective lens with point of interaction of cross-wires

	A	B	C	D
a.	3	4	2	1
b.	4	3	2	1
c.	3	4	2	1
d.	4	3	1	2

84. Which one of the following methods of levelling eliminates .the error due to curvature and refraction?
   a. Fly levelling
   b. Levelling by equalizing the distances of backsight and foresight
   c. Check levelling
   d. Precise levelling

85. The standard measurement of the Geodimeter 510 is
   a. ± 1 cm
   b. ± 5.1 mm
   c. $\sqrt{5.1}$ mm
   d. ± 1 mm

86. Match List I (type of Transition Curves) with List II (Characteristics) and select the correct answer :

   List I
   A. Glover's spiral
   B. Cubic spiral
   C. Froude's transition
   D. Bernoulli's lemniscate

   List II
   1. An autogenous curve of an automobile
   2. Radius of curvature at any point varies inversely as the distance from the beginning of the curve
   3. $\sin \phi = \phi$
   4. $x = l, \cos \phi = 1$

	A	B	C	D
a.	2	3	4	1
b.	3	2	1	4
c.	2	3	1	4
d.	3	2	4	1

87. If g_1 and g_2 are the two gradients, r is the rate of change of grade (%) per chain, the length of the vertical curve will be
   a. $\left(\dfrac{g_1 + g_2}{r_2} \right)$
   b. $\left(\dfrac{g_1 - g_2}{\sqrt{r}} \right)$
   c. $\left(\dfrac{g_1 - g_2}{r} \right)$
   d. $\dfrac{\sqrt{g_1 - g_2}}{r^3}$

88. The relation between the air-base B, photographic base b, flying height H and focal length f of lens in a vertical photograph is given by
   a. $B = bH / f$
   b. $B = f / bH$
   c. $B = b / fH$
   d. $B = \dfrac{b}{H - f}$

89. Which one of the following is taken into consider cation for computing traffic capacity per lane of the highway?
   a. Passenger cars and light vehicles
   b. Trucks and buses
   c. Two -wheelers
   d. Equivalent of passenger cars

90. In which one of the following location surveys of the road soil profile is sampling done up to a depth of 1 m to 3 m below the existing ground level?
   a. Preliminary survey
   b. Final location survey
   c. Construction survey
   d. Material location survey

91. The camber provided on a sloping road is 1 in 48. Which one of the following is the ruling gradient?
   a. 1 in 15
   b. 1 in 20
   c. 1 in 24
   d. 1 in 30

92. Which of the following are the accepted criteria for design of valley curve for highways ?
   1. Headlight sight distance

2. Passing and non-passing sight distance
3. Aesthetic consideration
4. Motorist comfort
5. Drainage control

Select the correct answer using the codes given below :

a. 1, 2, 3 and 4
b. 1, 3, 4 and 5
c. 2, 3, 4 and 5
d. 1 and 5

93. Match List I (Tests) with List II (Properties) select the correct answer :

List I

A. CBR test
B. Plate bearing test
C. Triaxial test
D. Stabilometer and Cohesionmeter test

	A	B	C	D
a.	1	2	3	4
b.	2	1	3	4
c.	1	2	4	3
d.	2	1	4	3

94. Match List I (Method of Traffic Volume counts) with List II (Equipment Used) and select the correct answer :

List I

A. Manual count
B. Combination of manual and mechanical methods
C. Automatic devices
D. Photographic method

List II

1. Video-recorder
2. Pneumatic tube
3. Watch
4. Multiple pen

	A	B	C	D
a.	4	3	1	2
b.	3	4	2	1
c.	4	3	2	1
d.	3	4	2	2

95. Match List I (Type of study) with List II (data collected) and select the correct answer :

List I

A. Public transport inventory study

B. Public transport O-D study
C. Public transport usage study

List II

1. Starting and destination of riders
2. Available routing and scheduling
3. Vehicle-km, earning per km
4. Passenger-km, IVTT, walking time, waiting time

	A	B	C	D
a.	1	2	3	4
b.	2	1	3	4
c.	1	2	4	3
d.	2	1	4	3

96. Match List I (Type of Traffic Signals) with List II (Advantages) and select the correct answer :

List I

A. Pre-timed signals
B. Vehicle-actuated signals
C. Semi-vehicle actuated signals
D. Linked traffic

List II

1. Useful for junction of a side street having low traffic volume with a main street having heavy flow
2. Overall optimization of traffic flow
3. Delay is held to a minimum, and maximum lane capacity is achieved
4. Most successfully used in linked system

	A	B	C	D
a.	3	4	1	2
b.	4	3	1	2
c.	3	4	2	1
d.	4	3	2	1

97. Breathing length of LWR is the

a. End portion which gets affected by temperature variation
b. End portion which does not get affected by temperature variation
c. Central portion which gets affected by temperature variation
d. Central portion which does not get affected by temperature variation

98. Grade compensation on curves in Indian Railways for BG is

a. 0.40% per degree of curve

b. 0.06% per degree of curve

c. 0.04% per degree of curve

d. 0.02% per degree of curve

99. The distance between the running faces of the stock- rail and gauge face of tongue rail measured at the heel of the switch is known as

a. Flangeway clearance

b. Throw of switch

c. Heel divergence

d. Flare

100. Match List I (Track Parameter) with List II (Equipments Used) and select the correct answer

List I

A. Unevenness

B. Gauge

C. Superelevation

D. Alignment

List II

1. Track recording car

2. Amsler car

3. Feeler and spring

4. Gyroscopic pendulum

	A	B	C	D
a.	2	3	1	4
b.	3	2	1	4
c.	2	3	4	1
d.	3	2	4	1

101. Match List I (Tunnel Construction Methods) with List (Advantages) and select the correct answer:

List I

A. Full face method

B. Heading and Bench method

C. Drift method

D. Compressed air method

List II

1. Helps in ventilation of tunnel

2. Useful in soft and water- bearing soil

3. Simultaneous drilling and mucking is possible

4. Tunneling is continuous

	A	B	C	D
a.	4	3	2	1
b.	3	4	1	2
c.	4	3	1	2

d. 3 4 2 1

102. The monthly mean of maximum daily temperature and monthly mean of average daily temperature of the hottest month of the year are 49 °C and 40 °C respectively. Then airport reference temperature is

a. 43°C

b. 69.6°C

c. 37°C

d. 52°C

103. Which one of the following imaginary surfaces in airport is circular in plan with centre located at an elevation of 150 m above the airport reference point?

a. Conical surface

b. Transitional surface

c. Inner horizontal surface

d. Outer horizontal surface

104. Consider the following four components in an Instrumental Landing System

1. Threshold lights

2. Glide slope antenna

3. 'Z' markers

4. Localizer antenna

These components are installed in the direction of landing in the sequence

a. 4, 2, 3, 1

b. 1, 4, 3, 2

c. 3, 1, 2, 4

d. 2, 3, 4, 1

105. The critical depth of water flowing through a rectangular channel of width 5 m when discharge is 15 m^3/s is

a. $(2.25)^{1/2}$ m

b. $(1.6)^{1/2}$ m

c. $(0.46)^{1/3}$ m

d. $(0.64)^{1/3}$ m

106. Consider the following statements relating to centrifugal pumps

1. In centrifugal pumps discharge is proportional to speed of the impeller.

2. In centrifugal pumps discharge is proportional to the cube of the impeller diameter.

3. Specific speed is a criterion for selection of centrifugal pumps.

4. Cavitation in centrifugal pumps can be eliminated by avoiding sharp bends,

lowering velocity in suction pipe and by lowering temperature.

Which, of these statements are correct?

a. 1, 2 and 3
b. 1, 2 and 4
c. 2, 3 and 4
d. 1, 3 and 4

107. Assertion (A) : At the critical state of flow, the specific force is a minimum for the given discharge.

Reason (R) : For a minimum value of specific force, the first derivative of force with respect to depth should be unity.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

108. Assertion (A) : The vertical co-ordinate of the apex of the Q-curve is 2/3 E.

Reason (R) : The, horizontal co-ordinate of the apex of E-curve is 1.5 times $(q^2/g)^{1/3}$.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

109. Assertion (A) : The relative velocity of water of a Pelton Turbine equals the difference between the absolute velocities of water and vane.

Reason (R) : For a Pelton Turbine, the inlet blade angle is 180^0.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

110. Assertion (A) : Passive earth pressure is always greater than the earth pressure at rest and active earth pressure.

Reason (R) : In passive state the structure becomes the actuating, element and soil becomes the resisting element to maintain the stability.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

111. Assertion (A) : With the lining of canals, permissible velocity of flow is tower than that with concrete lining.

Reason (R) : The surface of tile lining becomes rough due to loss of surface material with high velocity.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

112. Assertion (A) : Canal escape serves as a safety valve for a canal.

Reason (R) Canal escape discharges the excess water in the parent canal due to sudden closure of outlets by the farmers.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

113. Assertion (A) : Most important activity in sewer line construction is to start constructing it from the tail and to check levels with a boning rod.

Reason (R) : Construction of sewer line from tail end is recommended because required number of pumping stations may be incorporated in sewer network design.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

114. Assertion (A) : The ultimate strength of soil material is determined by the stresses in the potential failure plane.

Reason (R) : The critical shear stress causing failure depends upon the properties of soil as well as on the normal stress in the failure plane.

a. Both A and R are individually true and R is the correct explanation of A

b. Both A and R are individually true but R is not the correct explanation of A

c. A is true but R is false

d. A is false but R is true

115. Assertion (A) : In a machine foundation subjected to vibrations, frequency of vibrations with damping is less than the natural frequency of vibrations of the system.

Reason (R) : The frequency of vibrations with damping ω_d and natural frequency of vibrations ω_n are related by the expression $\omega_d = \omega_n (1 - d^2)$

a. Both A and R are individually true and R is the correct explanation of A

b. Both A and R are individually true but R is not the correct explanation of A

c. A is true but R is false

d. A is false but R is true

116. Assertion (A) : In a theodolite if the lower clamp is not properly clamped or the instrument is not firmly tightened on the tripod head, the error introduced is known as 'slip'

Reason (R) : If the shifting head is loose, the error 'slip' will be introduced.

a. Both A and R are individually true and R is the correct explanation of A

b. Both A and R are individually true but R is not the correct explanation of A

c. A is true but R is false

d. A is false but R is true

117. Assertion (A) : Prohibitory signs are part of regulatory signs which give a definite negative instruction regarding movement prohibition, restriction on weighty or speed of vehicles.

Reason (R) : According to the IRC Standards, prohibitory signs are of octagønal shape with side being 900 mm and with a white border and red background for the standard size.

a. Both A and R are individually true and R is the correct explanation of A

b. Both A and R are individually true but R is not the correct explanation of A

c. A is true but R is false

d. A is false but R is true

118. Assertion (A) : CST9 sleeper, a type of metal sleeper, has been extensively used by Indian Railways due to its uniform strength, economical and satisfactory performance.

Reason (R) : Metal sleeper is an inverted channel with folded ends. The folded edges which form a bulb resist the damage caused by the packing of ballast.

a. Both A and R are individually true and R is the correct explanation of A

b. Both A and R are individually true but R is not the correct explanation of A

c. A is true but R is false

d. A is false but R is true

119. Assertion (A) Packing is the method of forcing and packing stone ballast below the sleepers by ramming with a beater-cum-pickaxe.

Reason (R) : At points and crossings, packing is carried out by lifting the track by means of track jack and requisite quantity of stone chips is evenly spread below the sleepers by shovel and the chips are allowed to consolidate by running trains.

a. Both A and R are individually true and R is the correct explanation of A

b. Both A and R are individually true but R is not the correct explanation of A

c. A is true but R is false

d. A is false but R is true

120. Assertion (A) : Wet docks are enclosed or partially enclosed basins provided with locks and entrance gates to keep the water at fairly constant level for allowing vessels to come in, berth or leave at all times.

Reason (R) : Wet docks require expensive arrangements like lock gate and the walls are designed to withstand backfill pressure when the dock is full.

a. Both A and R are individually true and R is the correct explanation of A

b. Both A and R are individually true but R is not the correct explanation of A

c. A is true but R is false

d. A is false but R is true