CIVIL ENGINEERING

(PAPER–II)

1. Match List-I with List-II and select the correct answer using the code given below the lists :

List – I (Format of Representation)

A. $\dfrac{\delta u}{\delta x} + \dfrac{\delta v}{\delta y}$

B. $\dfrac{\delta v}{\delta x} - \dfrac{\delta u}{\delta y}$

C. $u\dfrac{\delta u}{\delta x} + v\dfrac{\delta v}{\delta y}$

D. $\dfrac{q\theta}{2\pi}$

List-II (Context /Relevant to)

1. Relevant to a velocity potential
2. Rate of rotation about a relevant axis
3. Pressure gradient in a relevant direction
4. Continuity of flow

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

2. Which one of the following expresses the height of rise or fall of a liquid in a capillary tube ?

a. $\dfrac{4wd}{\sigma \cos \alpha}$

b. $\dfrac{\sigma \cos \alpha}{4w\alpha}$

c. $\dfrac{\sigma 4\cos \alpha}{wd}$

d. $\dfrac{wd}{4\sigma \cos \alpha}$

w = Specific weight of the liquid

α = Angle of contact of the liquid surface

σ = Surface tension

3. If the stream function $\psi = 3x^2 - y^3$, what is the magnitude of velocity at point (2, 2)?

a. 9
b. 13
c. 15
d. 17

4. During a flood in a stream of width 200 (taken as rectangular section), the gauge reading was found to rise by 18 cm per hour. What would be the difference in discharges at two sections, each 250 m on either side of the gauge station ?

a. 10 m^3/ s less at downstream section
b. 75 m^3/ s less at downstream section
c. 5 m^3/ s less at downstream section
d. 5 m^3/ s more at downstream section

5. A flat plate with a sharp leading edge placed along a free stream of fluid flow. Local Reynolds number at 3 cm from the leading edge is 10^5.What is the thickness of the boundary layer?

a. 0.47 mm
b. 0.35 mm
c. 0.23 mm
d. 0.12 mm

6. Which one of the following is the correct statement? A streamlined body is one for which the

a. skin friction is zero.
b. thickness of the body is less than 1/100 of its length
c. corners are rounded off.
d. separation occurs, if at all, at the farthest downstream part of the body

7. A circular pipe of radius R carries a laminar flow of a fluid. The average velocity is indicated as the local velocity at what radical distance, measured from the centre?

a. 0.50 R

b. 0.71 R

c. 0.67 R

d. 0.29 R

8. In the model of a highway bridge constructed to a scale of 1 : 25, the force of water on the pier was measured as 5 N. What is the force (approximate) on the prototype pier?

a. 15.6 kN

b. 25.3 kN

c. 78 kN

d. 90 kN

9. A river model is constructed to a horizontal scale of 1: 1000 and a vertical scale of 1:100. A model discharge of 0.1 m^3/ s would correspond to a discharge in the prototype, of what magnitude?

a. $10^2 \, m^3/s$

b. $10^3 \, m^3/s$

c. $10^4 \, m^3/s$

d. $10 \, m^3/s$

10. Body M has twice the weight, twice the projected area and twice the drag coefficient of body N. How many times is the terminal velocity of the body M in air, compared to that of the body N ?

a. 8

b. 2

c. $\sqrt{2}$

d. $1/\sqrt{2}$

11. A rectangular channel 3 m wide is laid on a slope of 0.0002. When the depth of flow in the channel is 1.5 m, what is the average boundary shear stress (nearly) ?

a. $0.3 \, N/m^2$

b. $0.15 \, N/m^2$

c. $3.0 \, N/m^2$

d. $1.5 \, N/m^2$

12. A right-angled triangular channel, symmetrical in section about the vertical, carries a discharge of 5 m^3/s with a velocity of 1.25 m/s. What is the approximate value of the Froude number of the flow?

a. 0.3

b. 0.4

c. 0.5

d. 0.6

13. Flow depths across a sluice gate are 2.0 m and 0.5 m. What is the discharge (per metre width) ?

a. $1.0 \, m^2/s$

b. $1.4 \, m^2/s$

c. $2.0 \, m^2/s$

d. $2.8 \, m^2/s$

14. A rectangular channel is 6 m wide and discharges 30 $m^3 \, s^{-1}$. The upstream depth is 2.0 m, acceleration due to gravity is 10 $m \, s^{-2}$. Then, what is the specific energy (approximate)?

a. 2.5

b. 0.3

c. 2.3

d. None of the above

15. For a smooth hump in a sub-critical flow to function as a broad crested weir, the height ΔZ of the hump above the bed must satisfy which one of the following ?

a. $\Delta Z \leq (E_1 - y_c)$

b. $\Delta Z \geq (E_1 - E_c)$

c. $\Delta Z \leq (E_1 - y_c)$

d. $\Delta Z \leq (E_1 - E_c)$

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

List - I (Flow Section Type)

A. Shallow parabolic

B. Triangular

C. Rectangular

D. Trapezoidal

List - II (Critical Discharge is proportional to :) [where y is the depth of fowl]

1. $y(z^{3/2})$

2. $y^{3/2}$

3. $y^{5/2}$

4. y^2

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

c. 2 1 4 3

d. 4 3 2 1

17. Which one of the following statements is not correct?

A control section in an open channel is the site

a. where the flow quantity can be controlled

b. at which flow is known to be critical

c. where the discharge can be measured

d. where the specific energy is determined

18. What is the normal depth in a wide rectangular channel carrying 0.5 m^2/s discharge at a bed slope of 0.0004 and Manning's n = 0.01 ?

a. 0.13 m

b. 0.32 m

c. 0.43 m

d. 0.50 m

19. Flow happens at a critical depth of 0.5 m in a rectangular channel of 4 m width. What is the value of discharge?

a. 5.4 m^3/s

b. 5.1 m^3/s

c. 4.9 m^3/s

d. 4.4 m^3/s

20. In a 4 cm diameter pipeline carrying laminar flow of a liquid with it $\mu = 1.6$ centipoise, the velocity at the axis is 2 m/s. What is the shear stress midway between the wall and the axis ?

a. 0.01 N/m^2

b. 0.0125 N/m^2

c. 0.0175 N/m^2

d. 0.02 N/m^2

21. A hydraulic jump occurs at the toe of a spillway. The depth before jump is 0.2 m. The sequent depth is 3.2 m. What is the energy dissipated in m (approximate)?

a. 27

b. 10.5

c. 15

d. 42

22. In connection with a gradually varied flow with notations y_0 = normal depth, y_c =

critical depth and y = depth in the gradually varied flow, Match List I with List II and select the correct answer using the code given below the lists :

List-I

A. $Y > y_0 > y$

B. $y_0 > y > y$

C. $y > y_c > y_0$

D. $y > y_0 > y_c$

List-II

1. M_1

2. S_3

3. M_2

4. S_1

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

23. In a wide rectangular channel, an increase in the normal depth 20% corresponds to how much (approximate) increase in discharge ?

a. 12%

b. 20%

c. 36%

d. 48%

24. A penstock is 2000 m long and the velocity of pressure wave in it is 1000 m/s. Water hammer pressure head for instantaneous closure of valve at the downstream end of the pipe is 60 m. If the valve is closed in 4 s, then what is the peak water hammer pressure in m of water?

a. 15

b. 30

c. 60

d. 120

25. At a rated capacity of 44 cumec, a centrifugal pump develops 36 m of head when operating at 725 r.p.m. What is its specific speed?

a. 327

b. 255

c. 350

d. 45

26. In an air flow the velocity is measured by a Pitot tube (coefficient = 1.0). The mass density of air can be taken as 1.2 kg/m^3. If the head difference in a vertical U - tube holding water is 12 mm, then what is the velocity of air in m/s

a. 10

b. 14

c. 17

d. 20

27. A single-acting reciprocating pump has a plunger diameter 25 cm and stroke 35 cm. The speed of the pump is 60 r.p.m., and it delivers 165 litres/second of water. What is the value of the theoretical discharge ?

a. 16.8 lps

b. 17.2 lps

c. 18.0 lps

d. 18.4 lps

28. To generate 8100 kW under a head of 81 m while working at a speed of 540 r.p.m., what type of turbine is suitable?

a. Pelton

b. Kaplan

c. Bulb

d. Francis

29. During a certain week a power plant turns out 8,400,000 kWhr and the peak load during the week is 100,000 kW. What is the load factor during the week

a. 40%

b. 45%

c. 50%

d. 60%

30. A standard, ground-based evaporation pan, corresponding to Indian Standards, is installed at the banks of a surface reservoir. The water surface area on a particular day is 100 heactares. The recorded evaporation loss from the pan, on a certain day, is nearly 4.0 cm. What is the anticipated evaporation loss from the reservoir for that day?

a. (1.8 to 2) × 10^4 m^3 per day

b. (2.5 to 2.75) × 10^4 m^3 per day

c. (3.0 to 3.25) × 10^4 m^3 per day

d. (3.8 to 4.05) × 10^4 m^3 per day

31. What is the probable maximum precipitation (PMP)?

a. Projected precipitation for a 100-yr return period

b. Maximum precipitation for all past recorded storms

c. Upper limit of rainfall, which is justified climatologically

d. Effective perceptible water

32. Which one of the following is a method of extending the length of record for a frequency curve at a station ?

a. Double Mass Curve method

b. The Station Year method

c. Thiessen method

d. Isohyetal method

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

List - I (Parameter)

A. Rainfall Intensity

B. Rainfall Excess

C. Rainfall Averaging

D. Mass Curve

List - II (Relatable Term)

1. Isohyets

2. Cumulative rainfall

3. Hyetograph

4. Direct Runoff hydrograph

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

34. The total observed runoff volume during a 4 hour storm with a uniform intensity of 2.8 cm/hr is 25.2 × 10^6 m^3 from a basin of 280 km^2 area. What is the average infiltration rate for the basin?

a. 36 mm/hr

b. 48 mm/hr

c. 52 mm/hr

d. 55 mm/hr

35. The rainfall hyetograph shows the variation of which one of the following?
   a. Cumulative depth of rainfall with time
   b. Rainfall depth with area
   c. Rainfall intensity with time
   d. Rainfall intensity with cumulative depth of rainfall

36. In constructing a 4 hour synthetic unit hydrograph for a basin, the lag time is estimated to be 40 hours. When will the peak discharge in the synthetic unit hydrograph occur from start of the storm?
   a. 36 hours
   b. 40 hours
   c. 42 hours
   d. 44 hours

37. Consider the following statements
   1. Only the surface flow constitutes the flood hydrograph due to an isolated storm.
   2. For a given storm, the flood peak is dependent on the drainage density.
   3. Fan shaped catchments give narrow hydrograph with low peak.

   Which of the statements given above is/are correct?
   a. 1, 2 and 3
   b. 1 and 3
   c. 2 only
   d. 3 only

38. A unit hydrograph for a watershed is triangular in shape with base period of 20 hours. The area of the watershed is 500 ha. What is the peak discharge in m³/hour?
   a. 7000
   b. 6000
   c. 5000
   d. 4000

39. How is the average velocity along the vertical in a wide stream obtained?
   a. By averaging the velocities at 0.2 & 0.8 depth from surface
   b. By measuring velocity at 0.6 depth below the surface
   c. By measuring velocity at half the depth

d. By measuring velocity at 0.1 times the depth below the surface

40. Groynes are adopted for river bank protection works. When it is placed inclined downstream in the direction of flow in the river, it is designated as which one of the following?
   a. Repelling groyne
   b. Attracting groyne
   c. Neither repelling nor attracting groyne
   d. Fixed groyne

41. The sequent depth ratio of a hydraulic jump in a rectangular channel is 16.48. What is the Froude number (approximate) at the beginning of the jump?
   a. 9.0
   b. 12.0
   c. 5.0
   d. 8.0

42. The quantitative statement of the balance between water gains and losses in a certain basin during a specified period of time is known as which one of the following?
   1. Water budget
   2. Hydrologic budget
   3. Groundwater budget

   Select the correct answer using the code given below
   a. 1 only
   b. 2 only
   c. 3 only
   d. None of the above

43. A soil sample has an exchangeable sodium percentage of 16%, its electrical conductivity is 32 milli - Mhos/cm and pH of 9.5. How is the soil classified ?
   a. Saline soil
   b. Saline - alkaline soil
   c. Alkaline soil
   d. None of the above

44. How is the determination of aquifer parameters S (Storage Coefficient) and T (Transmissivity Coefficient) done?
   1. By recording the drawdown in a pumped well at different time intervals.

6 of 15

2. By recording the drawdown in installed observation wells at different time intervals.

Select the correct answer using the code given below

a. 1 only
b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

45. Consider the following statements:

An aqueduct is a cross drainage work in which

1. a canal is carried over the drainage channel
2. a drainage channel is carried over the canal
3. both drainage channel and canal are at the same level.

Which of the statements given above is/are correct?

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

46. If the discharge required for different crops is 0.4 cumes in the field and the capacity factor and time factors are 0.8 and 0.5 respectively, then what is the design discharge for the distributory t its head

a. 0.80 Cumecs
b. 0.16 Cumecs
c. 1.0 Cumecs
d. 1.24 Cumecs

47. Which one of the following is the purpose of providing the downstream sheet pile in a barrage?

a. To control failure due to piping by high value of exit gradient
b. To control failure due to scour
c. To stop failure due to sliding
d. To stop failure due to uplift pressure

48. What are the recommended setting options of an adjustable proportional module worked with an open flume type outlet?

1. 3/10
2. 9/10

3. 1/2
4. 5/3

Select the correct answer using the code given below

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

49. The flood plain of a river carries a discharge of 2000 m³/s. What are the values of the meander length and dominant flow width?

a. 160 m,48 m
b. 180 m,42 m
c. 200 m, 38 m
d. 220 m, 36 m

50. What is eutrophication of lakes primarily due to ?

a. Multiplication of bacteria
b. Excessive inflow of nutrients
c. Increase in benthic organisms
d. Thermal and density currents

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

List - I (Parameter)

A. Excess sulphates
B. Lack of iodide
C. Excess hardness
D. Excess dissolved oxygen

List - II (Impact)

1. Greater soap consumption
2. Laxative effect
3. Goitre
4. Corrosion of pipes

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

52. The concentration of hardness producing cations estimated using which one of the following ?

a. Conductivity meter

b. pH meter

c. Spectrophotometer

d. Flame photometer

53. Which one of the following treatments is economically effective in the control of guinea worm disease?

a. Chlorination

b. Filtration

c. Ozonation

d. Sedimentation

54. Match List I with List II and select the correct answer using may be the code given below the lists :

List - I (Disinfectant)

A. Chlorine

B. Ozone

C. Iodine

D. Ultra-violet rays

List - II (Property)

1. No carcinogenics result

2. Ineffective in the presence of suspended solids

3. Not affected by the Ammonium ion

4. Feasible residual content

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

55. What is the predominating coagulation mechanism for raw water having high turbidity and high alkalinity?

a. Ionic layer compression

b. Adsorption and charge neutralization

c. Sweep coagulation

d. Inter particle bridging

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

List – I (Physical properties of filtering material for trickling filters)

A. Crushing strength, N/mm^2

B. Hardness

C. Percent wear

D. Specific gravity

List-II (Limiting Value)

1. 12.0

2. 100.0

3. 4.0

4. 2.6

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

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

List-I (Contaminant)

A. Suspended solids

B. Nutrients

C. Heavy metals

D. Dissolved inorganic solids

List-II (Environmental significance)

1. May cause eutrophication

2. Toxic, may interfere with effluent reuse

3. May interfere with effluent reuse

4. Cause sludge deposits

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

58. Which one of the following methods of solid waste management conserves energy most efficiently in the form of gas or oil?

a. Incineration with heat recovery

b. Composting

c. Fluidized - bed incineration

d. Pyrolysis

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

List - I (Equation/Method)

A. Manning's Equation

B. Darcy-Weisbach Equation

C. Hardy Cross Method

D. Rational Method

List - II (Application)

1. Frictional head loss estimation in pipe flow

2. Sanitary sewer design

3. Storm sewer design

4. Water distribution system design

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

60. In conventional activated sludge process, MLSS is generally kept in which range ?

a. < 100 mg/l

b. 1000 - 2000 mg/l

c. 2000 - 3000 mg/l

d. 3000 - 5000 mg/l

61. Match List I with List II and select the correct answer using the code given below the lists

List - I (Pathogen)

A. Bacteria

B. Virus

C. Protozoa

D. Helminth

List- II (Epidemic)

1. Gastroenteritis

2. Cholera

3. Worms

4. Polio

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

62. Which among the following brings about the Hazardous Waste Management and Handling Rules in India?

a. Central Pollution Control Board

b. Ministry of Environment and Forests

c. Ministry of Urban Development

d. Ministry of Rural Development

63. The daily cover of MSW landfills consists of which one of the following?

a. Compacted soil

b. Geomembrane

c. Geotextile

d. Geocomposite

64. Match List I with List II and select the correct answer using the code given below the lists

List-I (Air Pollutant)

A. Particulates

B. Carbon monoxide

C. Sulphur oxides

D. Photochemical oxidants

List-II (Impact on Human Health)

1. Impairs transport of O_2 in bloodstream

2. Irritation of mucous membranes of respiratory tract

3. Causes coughing, shortness of breath headache etc.

4. Causes respiratory illness

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

65. Which type of plume may occur during winter nights?

a. Looping

b. Inversion

c. Coning

d. Lofting

66. A machine in a steel plate fabricating industry is found to be producing a sound level of 50 dB. In the expansion plans one more such machine needs to be added. What will be the combined noise level?

a. 80 - 100 dB

b. 101 - 150 dB

c. 51 - 70 dB

d. 40 - 50 dB

67. Which one of the following is the correct statement? A heterotroph is an organism that obtains

    a. its cell carbon from an inorganic source.

    b. its energy from the oxidation of simple inorganic compounds.

    c. its cell carbon as well as its energy from organic matter.

    d. its energy from a natural ecosystem.

68. The term 'biological magnification' indicates which one of the following?

    a. Likelihood of increasing size of animals during evolution

    b. Magnification pertaining to microscopy

    c. Accumulation of pollutants in soil

    d. Accumulation of pollutants in successive consumers

69. Which one of the following is the correct statement ?

    The contact pressure distribution below rigid footing on the surface of a clay soil is

    a. uniform for the full width

    b. maximum at the centre and minimum at the edges.

    c. maximum at the edges and minimum at the centre.

    d. of an irregular shape

70. The following soils are compacted at the same compactive effort in the field. Which one of the following is the correct sequence in the increasing order of their maximum dry density?

    a. Silt clay - Clay - Sand - Gravel sand clay mixture

    b. Sand - Gravel sand clay mixture - Silty clay - Clay

    c. Clay - Silty clay - Sand - Gravel sand clay mixture

    d. Sand - Gravel sand clay mixture - Clay - Silty clay

71. Consider the following statements

    On addition of lime to a clay soil, generally

    1. M.D.D. and strength both increase.

    2. M.D.D. decreases but strength increases.

    3. M.D.D. and O.M.C. both increase.

    Which of the statements given above is correct ?

    a. 1 only

    b. 2 only

    c. 3 only

    d. None of the above

72. From a flow net which of the following information can be obtained ?

    1. Rate of flow

    2. Pore water pressure

    3. Exit gradient

    4. Permeability

    Select the correct answer using the code given below :

    a. 1, 2, 3 and 4

    b. 1, 2 and 3

    c. 2, 3 and 4 only

    d. 1 only

73. Consider the following statements

    1. Organic matter increases the permeability of a soil

    2. Entrapped air decreases the permeability of a sil

    Which of the statements given above is/are correct?

    a. 1 only

    b. 2 only

    c. Both 1 and 2

    d. Neither 1 nor 2

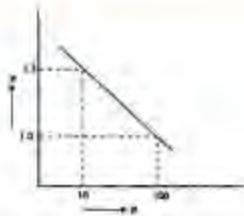74. Consider the following statements

    Dewatering increases the slope stability of a cohesionless soil mainly because

    1. it causes changes in pH.

    2. it reduces pore water pressure.

    Which of the statements given above is/are correct ?

    a. 1 only

    b. 2 only

    c. Both 1 and 2

    d. Neither 1 nor 2

75.

The virgin compression curve for a soil is shown in the figure above. What is the compression index of the soil ?

a. 0.3
b. 0.5
c. 1.5
d. 15

76. What does the confining pressure used in triaxial compression tests on an undisturbed soil sample represent ?

a. The in-situ total normal stress
b. The in-situ total lateral stress
c. The in-situ effective average principal stress
d. The in-situ shear stress

77. Consider the following statements

Liquefaction is a phenomenon

1. observed in fine sands
2. associated with development of positive pore pressure.

Which of the statements given above is/are correct ?

a. 1 only
b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

78. A static cone penetration test is usually conducted when the structure is likely to be founded on which of the following?

a. Shallow foundations
b. Pile foundations
c. Drier foundations
d. Improved ground

79. A machine and its foundation weigh 981 kN and has a spring constant k = 10,000 kN/m. What is the value of damping coefficient C_c if system is to be critically damped ? (Acceleration due to gravity g = 9.81 m/s^2)

a. 1000 kN s/m
b. 4000 kN s/m
c. 2000 kN s/m
d. 8000 kN s/m

80. Consider the following statements

1. The bearing capacity of a footing on clay does not significantly get altered by the presence of water table
2. The bearing capacity of a footing on saturated clay ($\phi = 0$) is a function of its size.

Which of the statements given above is/are correct ?

a. 1 only
b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

81. Which of the following types of piles is likely to have the highest load capacity in compression?

a. Driven pre - cast concrete pile
b. Pre - cast pile placed in a pre - drilled bore
c. Driven steel pipe pile
d. Steel pipe pile placed in a pre-drilled bore

82. What is the value of negative skin friction for a group of piles of 30 cm diameter, 5 M long and spaced at 80 cm c/c and having cohesive strength of soil as 25 kN/m^2 (Neglect bottom contribution in bearing capacity)

a. 925 kN
b. 950kN
c. 975 kN
d. 1000 kN

83. If the coefficient of active earth pressure is 1/3, then what is the value of the coefficient of passive earth pressure ?

a. 1/9
b. 1/3
c. 3
d. 1

84. Consider the following statements

Criteria for satisfactory performance of footings are that the

1. soil supporting the footing must be safe against shear failure.
2. footing must not settle more than a pre-specified value.
3. footing must be rigid.
4. footing should be above water table.

Which of the statements given above are correct ?

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

85. Why are weep holes provided at the back of retaining walls?

a. To reduce the active earth pressure on the walls
b. To reduce the build - up of hydrostatic pressure
c. To provide better compaction
d. To increase the passive earth pressure

86. An increase in compaction effort will lead to which of the following?

a. Decrease in both the optimum moisture content (OMC) and maximum dry density
b. Decrease in both the optimum moisture content (OMC) and increase in the maximum dry density
c. Increase in the optimum moisture content (OMC) and decrease in the maximum dry density
d. Increase in both the optimum moisture content (OMC) and maximum dry density

87. A 20 m chain was found to be 10 cm too long after chaining a distance of 2000 m. It was found to be 18 cm too long at the end of the day's work after chaining a total distance of 4000 m. What is the true distance if the chain was correct before the commencement of the day's work ?

a. 3962 m
b. 4019 m
c. 3981 m
d. 4038 m

88. There are ten instrument stations occupied in succession during a traverse survey. An observer makes equal error in each station, the magnitude of which is $\delta\theta$ in each instance at all the stations. What is the probable error of the final bearing at the end of the traverse ?

a. $\pm 10\,\delta\theta$
b. $\pm 100\,(\delta\theta)^2$
c. $\pm 10\sqrt{\delta\theta}$
d. $\pm \sqrt{10}\,\delta\theta$

89. Which of the following instruments have both horizon glass and index glass?

1. Optical square
2. Line ranger
3. Box sextant
4. Pedometer

Select the correct answer using the code given below

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

90. Which one of the following instruments can be used as a clinometer?

a. Prism square
b. Line ranger
c. Abney level
d. Optical square

91. Match List I with List II and select the correct answer using the code given below the Lists :

List - I (Instrument)

A. Subtense bar
B. Sextant
C. Tangent clinometer
D. Range finder

List - II (Use)

1. To determine difference in elevation between points
2. To determine horizontal distance
3. To measure angles
4. To establish right angles

	A	B	C	D
a.	2	4	1	3

b.   1   3   2   4

c.   2   3   1   4

d.   1   4   2   3

92. A sailor, standing on the deck of a ship, just sees the light beam from a lighthouse on the shore. If the height of the sailor's eye and of the light beam at the lighthouse, above the sea level, are 9 m and 25 m respectively, what is the distance between the sailor and the lighthouse ?

   a.   29.8 km

   b.   31.1 km

   c.   31.9 km

   d.   33.2 km

93. Which one of the following statements is correct?

   a. The axis of plate level should be parallel to the vertical axis.

   b. The axis of striding level must be parallel to the horizontal axis.

   c. The axis of the altitude level must be perpendicular to the line of collimation.

   d. The line of collimation must be perpendicular to the plate level axis.

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

List- I (Triangulation Station)

A. Main Stations

B. Subsidiary

C. Satellite Stations

D. Pivot Stations

List—II (Definition)

1. Control points of triangulation network

2. Points not for observation but for continuation of triangulation network

3. Points to provide additional rays to intersected points

4. Points close to main stations to avoid intervening obstructions

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

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

List I(Term)

A. Apparent solar day

B. Sidereal day

C. Tropical year

D. Sidereal year

List - II (Definition)

1. The time interval between two successive upper transits of the first point of Aries over the same meridian

2. 2. Time interval between two successive lower transits of the center of the Sun across the same meridian

3. 3. Time interval between two successive passage of the Sun over the meridian of any of the fixed stars

4. The time interval between two successive vernal equinoxes

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

96. If the mean temperature of Sun's surface 6000 K and λm of its radiation is 0.5 what is the mean temperature of Each surface for which λm is 100 m, according to Wien's Displacement Law in Remote Seniror Concept?

   a.   25 °C

   b.   28 °C

   c.   27°C

   d.   30 °C

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

List - I (Type of Construction)

A. Bituminous macadam

B. Dense bituminous macadam

C. Bituminous concrete

D. Bitumen mastic

List - II (Binder Content Generally Specified)

1. 8- 15%

2. 3 - 35%

3. 4 - 45%

4. 45 - 60%

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

98. If a road surface is adequately superelevated on horizontal curve, which one of the following is the proper distribution of pressure on the vehicle wheels ?

a. Pressure on both outer and inner wheels is equal

b. Pressure on inner wheels is more than the outer wheels

c. Pressure on inner wheels is less than the outer wheels

d. Pressure on front wheels is thrice the pressure on rear wheels

99. Consider the following statements related to interchanges

1. In diamond interchange there is the possibility of illegal wrong - way turns.

2. Diamond interchange is far superior to cloverleaf design.

Which of the statements given above is/are correct?

a. 1 only

b. 2 only

c. Both 1 and 2

d. Neither 1 nor 2

100. Based on Fuller's maximum density criterion, for 4 mm maximum size of soil particles, what is the percentage of particles between 4 mm and 2 mm by weight?

a. 80

b. 50

c. 30

d. 20

101. What are the maximum value of CBR and minimum value of G.I. of any material, respectively?

a. 100,0

b. 100,20

c. 50, 5

d. 10, 0

102. Consider the following statements related to Los Angeles Abrasion test on aggregates

1. It evaluates hardness of source - rock.

2. It has a coefficient of variation of about 30 percent

Which of the statements given above is/are correct ?

a. 1 only

b. 2 only

c. Both 1 and 2

d. Neither 1 nor 2

103. A road surface is corrected by spreading a layer of dry sand in a thickness varying from 5 mm to 10 mm and rolling the surface by heavy rollers. Which one of the following maintenance works does it apply to?

a. Repair of ruts and patches

b. Repairing of blow ups

c. Repair of bleeding surface

d. Sealing of joints and cracks

104. The weight of aggregate having specific gravity 2.65, completely filled into a cylinder of volume 0.003 m^3 is 52 kg. What is the value of the angularity index of aggregate (approximately) as given by Murdock?

a. 1

b. 0.34

c. 0.15

d. 0.05

105. Which one of the following criteria is used for obtaining the value of modulus of subgrade reaction from plate bearing test data?

a. Slope of pressure settlement graph

b. Pressure corresponding to the settlement of 1.25 mm

c. Deflection corresponding to a pressure of 1.25 kg/cm^2

d. Pressure corresponding to the settlement of 1.50 mm

106. Which of the following factors are used for calculating temperature stress at the critical edge region in rigid pavement design ?

1. Maximum temperature difference between summer and winter
2. Coefficient of thermal expansion of concrete
3. Slab length
4. Slab width

Select the correct answer using the code given below

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

107. Match List I with List II and select the correct answer using the code given below the lists

List – I (Type of Wall)

A. Parapet wall
B. Check wall
C. Breast wall
D. Gabion wall

List – II (Feature)

1. Constructed with dry stone masonry encased in wire mesh
2. To add the overall stability to the hill face
3. To buttress the uphill slopes of the road cross – section
4. To give protection to the motorists

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

108. Emulsion is used as a binder in which the following stages of construction ?

1. Surface dressing work
2. Sealing open textured surfacing
3. Filling cracks in pavement
4. Prime coat
5. Pre-coating of aggregates

Select the correct answer using the code given below

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

109. Match List I with List II and select the correct answer using the code given below the lists

List-I (Speed)

A. Space mean speed
B. Journey speed
C. Running speed
D. Spot speed

List-II (Application)

1. Road conditions studies
2. Regulatory measures
3. Traffic flow studies
4. Delay studies

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

110. Which one of the following methods is generally considered the best for tunnel ventilation ?

a. Driving a drift through the tunnel
b. 'Blow in' method
c. 'Blow out' method
d. Combination of 'Blow in' and 'Blow out' methods

111. Which one of the following is not related to theories of creep of rails ?

a. Wave theory
b. Percussion theory
c. Drag theory
d. Reversal theory

112. What is the steepest gradient permissible on a 2° curve for B.G. line having reeling gradient of 1 in 200?

a. 1 in 250
b. 1 in 238
c. 1 in 209

d. 1 in 198

113. Which one of following is not correct for container ports ?

a. The berth capacity is great

b. Overall transit time is less

c. There is minimal damage to cargo

d. Minimal land is required for the marshalling area

114. Which one of following statements associated with groynes :

1. Hydraulic behaviour of a system of groynes is influenced by the characteristics of particles that constitute the littoral drift.

2. Groyne is constructed approximately parallel to shore.

Which of the statements given above is/are correct ?

a. 1 only

b. 2 only

c. Both 1 and 2

d. Neither 1 nor 2

115. What is the wave velocity for a uniform train of wave beyond the storm centre for a wave length of 20 m in 14 m deep water?

a. 5.5 m/s

b. 11.2 m/s

c. 4.5 m/s

d. 9 m/s

116. As the elevation increases, the runway length has to be changed at what rate ?

a. Decreased @ 5% per 300 m rise in elevation above M.S.L.

b. Increased @ 7% per 300 m rise in elevation above M.S.L.

c. Decreased @ 9% per 300 m rise in elevation above M.S.L.

d. Increased @ 15% per 300 m rise in elevation above M.S.L.

117. Assertion (A) : A discrete particle (of diameter d_0) setting in a circular sedimentation tank follows a parabolic path.

Reason (R) : The downward settling velocity (v_0) of the discrete particle (of diameter d_0) in a circular sedimentation tank does not change with time.

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) : Shear strength parameters of sand can be estimated by conducting unconfined compression test.

Reason (R) : The effective angle of shearing resistance of sand is nearly the same for dry and saturated sands, in drained condition.

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) : Estimation of settlement of foundations on sandy soils can be done by using SPT values.

Reason (R) : Sampling in cohesionless soils without disturbing the structure is difficult.

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) : The water content of inorganic soils is determined by heating the soil in an oven at a temperature of 105° to 110° C.

Reason (R) : The free water, adsorbed water & structural water are all completely removed from the soil by heating it at 105° to 110° C.

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