A
SET

Booklet No. :

CE - 16

Civil Engineering

Duration of Test : 2 Hours

Max. Marks : 120

Hall Ticket No.

Name of the Candidate :

Date of Examination : OMR Answer Sheet No. :

Signature of the Candidate

Signature of the Invigilator

INSTRUCTIONS

1. This Question Booklet consists of **120** multiple choice objective type questions to be answered in **120** minutes.
2. Every question in this booklet has 4 choices marked (A), (B), (C) and (D) for its answer.
3. Each question carries **one** mark. There are no negative marks for wrong answers.
4. This Booklet consists of **16** pages. Any discrepancy or any defect is found, the same may be informed to the Invigilator for replacement of Booklet.
5. Answer all the questions on the OMR Answer Sheet using **Blue/Black ball point pen only.**
6. Before answering the questions on the OMR Answer Sheet, please read the instructions printed on the OMR sheet carefully.
7. OMR Answer Sheet should be handed over to the Invigilator before leaving the Examination Hall.
8. Calculators, Pagers, Mobile Phones, etc., are not allowed into the Examination Hall.
9. No part of the Booklet should be detached under any circumstances.
10. The seal of the Booklet should be opened only after signal/bell is given.

CIVIL ENGINEERING (CE)

1. A system of homogeneous linear equations $AX = 0$ has a nontrivial solution if
   (A) $|A| = -1$ (B) $|A| \neq 0$ (C) $|A| = +1$ (D) $|A| = 0$

2. If 2, 1+2i are the eigen values of a third order matrix A, then the third eigen value is
   (A) 1− 2i (B) 1 + i (C) 2 + 3 i (D) 1/2

3. If $f(x) = (x-1)(x-2)$ satisfy Lagrange Mean Value theorem at c in the interval [1,3], then $c =$
   (A) 3 (B) 1 (C) 2 (D) 0

4. If $x = r\cos\theta$, $y = r\sin\theta$, $z = z$, then the value of $\frac{\partial(x,y,z)}{\partial(r,\theta,z)}$
   (A) r^2 (B) $\frac{1}{r}$ (C) $r\tan\theta$ (D) r

5. If $y = cx - c^3$ is the general solution of the differential equation
   (A) $x^2 - xy' - y = 0$ (B) $(y')^2 - xy' + y = 0$
   (C) $x^2 - xy' - y = 0$ (D) $y' = 0$

6. The complementary function of $y'' - 2y' + y = e^x \cos x$ is
   (A) $c_1\cos x + c_2 \sin x$ (B) $c_1 e^x + c_2 e^{-x}$
   (C) $(c_1 x + c_2)e^x$ (D) $c_1 y + c_2 (y')^2$

7. If X is a Poisson distributed variable and $P(X = 0) = \frac{1}{e^2}$, then the probability distribution function is
   (A) $\frac{e^{-2}2^x}{x!}$ (B) $\frac{e^{-3}3^x}{x!}$ (C) $\frac{2^x}{x!}$ (D) $\frac{1}{x!}$

8. If the mean and variance of a binomial distribution are 4 and 3 respectively, then the probability distribution is
   (A) $C_x^8 \left(\frac{3}{4}\right)^x \left(\frac{1}{4}\right)^{8-x}$ (B) $C_x^{16} \left(\frac{3}{4}\right)^x \left(\frac{1}{4}\right)^{16-x}$
   (C) $C_x^8 \left(\frac{1}{4}\right)^x \left(\frac{3}{4}\right)^{8-x}$ (D) $C_x^{16} \left(\frac{1}{4}\right)^x \left(\frac{3}{4}\right)^{16-x}$

9. One root of the equation $f(x) = 2x^2 - 5x + 2 = 0$ lies in the interval
   (A) (0,1) (B) (1,2) (C) (−1,0) (D) (−2,0)

10. The method of successive approximation $x_{i+1} = \phi(x_i)$ converges if

(A) $|\phi'(x)| < 1$ (B) $|\phi'(x)| > 1$

(C) $|\phi'(x)| > 0$ (D) $|\phi'(x)| < 2$

11. A cantilever beam is subjected to a moment at the free end. The shape of the shear force diagram is a

(A) Straight line (B) Rectangle

(C) Triangle (D) Parabola

12. In a simply supported beam subjected to _____ loading , the shapes of the shear force diagram and bending moment diagram will be similar

(A) Uniformly distributed (B) Uniformly varying

(C) Exponential (D) Sinusoidal

13. A number of forces acting on a point will be in equilibrium if

(A) Sum of all the forces is zero

(B) Sum of the resolved components of forces in vertical direction is zero

(C) Algebraic Sum of the vertical and horizontal components is zero

(D) All the forces are equally inclined

14. The point of contraflexure in a fixed beam subjected to uniformly distributed load is_____ times the span of the beam.

(A) 0.2 (B) 0.33 (C) 0.4 (D) 0.5

15. The rotation at the free end of a cantilever beam subjected to a concentrated load of 10kN is 0.003 radians. If the same beam is subjected at an end moment 15kNm at the free end, then deflection at the free end is

(A) 1.5mm (B) 2.5mm (C) 3.5mm (D) 4.5mm

16. In a symmetrical I section, the maximum shear stress is carried by

(A) Top flange

(B) At the junction of top flange and web

(C) Web

(D) Shear centre

17. The ratio of elongation of a conical bar due to its own weight and that of a prismatic bar is

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{1}{5}$

18. An accurate expression for curvature at any point along the curve of the deformed shape of a beam is

(A) $\pm(dy/dx)/(1+d^2y/dx^2)^{1/2}$ (B) $\pm(d^2y/dx^2)/(1+(dy/dx)^2)^{3/2}$

(C) $\pm(d^2y/dx^2)/(1+d^2y/dx^2)^{1/2}$ (D) $\pm(dy/dx)/(1+d^2y/dx^2)$

19. Two beams of rectangular section are A and B. Beam A is 300 × 500 mm and Beam B is 500 × 300 mm. The ratio of torsional strength of beam A to B is
(A) 1.0 (B) 2.0 (C) 1/2 (D) 3

20. The bending stress in a beam is
(A) More than section modulus
(B) Equal to section modulus
(C) Directly proportional to section modulus
(D) Inversely proportional to section modulus

21. The volumetric strain in thin cylindrical shell due to internal pressure is
(A) $\frac{pd}{2tE}\left(1-\frac{1}{m}\right)$ (B) $\frac{pd}{2tE}\left(\frac{5}{2}-\frac{2}{m}\right)$
(C) $\frac{3pd}{4tE}\left(1-\frac{1}{m}\right)$ (D) $\frac{3pd}{4tE}\left(\frac{5}{2}-\frac{2}{m}\right)$

22. The slenderness ratio of a vertical column of a circular cross section of radius 25 mm and 3 metre effective length is
(A) 120 (B) 240 (C) 360 (D) 480

23. The buckling load does not depend on
(A) Modulus elasticity of the material
(B) Cross sectional dimension of the column
(C) Length of column
(D) Compressive strength of materials

24. A three hinged arch is_____structure.
(A) Curved beam in elevation (B) Quasi static
(C) Statically determinate (D) Statically indeterminate

25. A_____beam is kinematically determinate but statically indeterminate.
(A) Cantilever (B) Simply supported
(C) Propped cantilever (D) Fixed beam

26. If U is the total strain energy of the trunk and W is the single load applied at the joint then the deflection under the applied load is $\Delta = k\left(\frac{U}{W}\right)$ where k is a constant and its value is
(A) 1 (B) 2 (C) 1/2 (D) 3

27. A square , singlebay, fixed portal frame ABCD is subjected to a horizontal load P at the top of column AB towards right. The shear equation is
(A) $(M_{AB}+M_{BA})/L)+(M_{BC}+M_{CB})/L)+P=0$
(B) $(M_{BC}+M_{CB})/L)+(M_{CD}+M_{DC})/L)+P=0$
(C) $(M_{AB}+M_{BA})/L)+(M_{CD}+M_{DC})/L)+P=0$
(D) $(M_{AB}+M_{BA})/L)-(M_{CD}+M_{DC})/L)+P=0$

28. The flexibility co-efficient in matrix method of analysis depends on
(A) Geometry, loading and elastic properties
(B) Geometry and elastic properties
(C) Loading and geometry
(D) Geometry and loading

29. In Stiffness method of Matrix Analysis of Structures, the unknowns to be determined are
(A) Stresses (B) Strains
(C) Forces (D) Displacements

30. When a concentrated load W moves over a railway bridge of span L, the equivalent uniformly distributed is_____(W/L)
(A) 1 (B) 2 (C) 4 (D) 8

31. The approximate compressive strength of concrete at 7 days to 28 days is ____ percent
(A) 30 (B) 50 (C) 70 (D) 80

32. An RC rectangular slab has the dimensions 'l_y' in longer span and 'l_x' along the shorter span respectively. The ratio $(l_y/l_x)<2$ and it is supported on opposite longer sides and the other two sides are free. It is to be designed as
(A) Elastically restrained slab (B) Flat slab
(C) One way slab (D) Two way slab

33. The permissible stress in concrete of an RC beam under shear is computed from percentage of _____ and _____
(A) Tensile steel, Concrete grade
(B) Shear reinforcement, Concrete grade
(C) Compression and tension steel
(D) Compression steel and Concrete grade

34. The short term deflection of an RC beam is calculated using the value of modular ratio 'm' as
(A) E_s/E_c (B) $280/3\sigma_{cbc}$ (C) E_c/E_s (D) $3\sigma_{cbc}/280$

35. In an RC element, 8 mm diameter bars are to be provided at 80 mm centre to centre. If 10 mm dia bars are to be used in place of 8 mm then the spacing is _____mm.
(A) 100 (B) 125 (C) 150 (D) 180

36. If m is the modular ratio and p is the steel ratio and if $\alpha=mp$ then the elastic neutral axis_____times the effective depth

(A) $-\alpha \pm \sqrt{\alpha^2 + 2\alpha}$ (B) $\alpha^2 \pm \sqrt{\alpha}$

(C) $mp^2 + \sqrt{mp^2 + 2m^2p}$ (D) $mp^2 + \sqrt{\alpha^2 + 2mp}$

37. In the load balancing method applied to PSC beams with parabolic cables, the equivalent distributed load is_____ (Pe/l^2)

(A) 6 (B) 4 (C) 8 (D) 2

38. The minimum and maximum percentage of compression reinforcement in column is _____ of the gross area.

(A) 0.8% and 4% (B) 0.8% and 6%

(C) 0.8% and 8% (D) 0.8% and 2%

39. The maximum spacing of vertical stirrups is

(A) 1.0 d (B) 0.75 d or 300 mm whichever is less

(C) 300 mm (D) 1.0 d or 300 mm whichever is less

40. Critical section for one way shear in footing is taken from the face of column at a distance of

(A) d/2 (B) d/3 (C) d (D) d/4

41. In property class of 8.8 bolts the first number 8 and the second number 8 indicate ultimate tensile stress of_____ and yield stress of _____

(A) 800/800 MPa (B) 800/640MPa

(C) 88/880 MPa (D) 64/880 MPa

42. The number of plastic hinges requires to form a mechanism in case of propped cantilever subjected to udl is

(A) 1 (B) 2 (C) 3 (D) 4

43. Lug angles are used to

(A) Reduce the joint length and shear lag

(B) Increase the strength of joint

(C) Increase the joint length

(D) Increase the shear lag

44. In the analysis of beam columns, principle of_____ is not valid.

(A) D'Alembert (B) Virtual work

(C) Superposition (D) Transmissibility

45. The economical depth of welded plate girder for M=6800 kNm, (d/tw)=180 and f_y=250MPa is approximately_____mm

(A) 1500 (B) 1700 (C) 2000 (D) 1250

46. In the design of column bases the bearing strength of concrete as per IS 800 is taken as _____
(A) 0.7 fck (B) 5000 fck (C) 0.45 fck (D) 0.6 fck

47. The lacing bars in built up column is to be designed for a total transverse shear equal ___ of the column load and the slenderness ratio of the lacing should not exceed____
(A) 1/50,180 (B) 1/30,145 (C) 1/40,250 (D) 1/40,145

48. The design compressive strength of an axially loaded compression member as per IS 800-2007 is based on _____ formula
(A) Euler's (B) Merchant Rankine
(C) Perry Robertson (D) Secant

49. The minimum size of weld should not be less than _____ mm and more than _____ thickness of plate.
(A) 3, 1 time (B) 5, 1.5 times
(C) 6, 2 times (D) 8, 3 times

50. In the plastic analysis of beams, the upper bound theorem satisfy ___ conditions
(A) Compatibility and equilibrium
(B) Mechanism and equilibrium
(C) Yield and equilibrium
(D) Mechanism and plastic moment capacity

51. A saturated undisturbed sample from a clay stratum has a moisture content of 30% and a specific gravity of 2.7. The void ratio of the clay is
(A) 1.89 (B) 0.945 (C) 0.81 (D) 0.205

52. The void ratios of sand sample in the densest and loosest conditions are 0.4 and 1.2 respectively. The relative density of the soil for the in-situ void ratio of 0.6 will be
(A) 60% (B) 75% (C) 65% (D) 80%

53. The field density and field moisture content of a soil can be determined by
1. Core cutter method
2. Sand replacement method
3. Proctor compaction test
4. Modified Proctor compaction test
(A) 1, 2, 3 and 4 (B) 1 and 2 only
(C) 2 and 3 only (D) 2 and 4 only

54. The liquid limit and plastic limit of a specimen of clayey silt are 40% and 20% respectively. The natural moisture content is 30%. Its plasticity index and consistency index will respectively be
(A) 20% and 0.5 (B) 20% and 2.0
(C) 30% and 0.72 (D) 20% and 0.38

55. If soil is dried beyond shrinkage limit, it will show
(A) large volume change (B) moderate volume change
(C) low volume change (D) no volume change

56. Consider the following statements.
1. Organic matter decreases the permeability of soil
2. Entrapped air decreases the permeability of soil
Which of these statements is/are correct?
(A) 1 only (B) 2 only
(C) Both 1 and 2 (D) Neither 1 nor 2

57. Effective stress on soil
(A) increases void ratio and decreases permeability
(B) increases both void ratio and permeability
(C) decreases both void ratio and permeability
(D) decreases void ratio and increases permeability

58. The soils most susceptible to liquefaction are
(A) saturated dense sands
(B) saturated fine sands of uniform particle size
(C) saturated clays of uniform size
(D) saturated gravels and cobbles

59. During consolidation process of clayey soils, indicate the sequence of the following in the order from first to last.
1. Load being taken up by the pore water
2. Load being taken up by the soil grains
3. Drainage of water from the pores of the soil
(A) 1, 2 and 3 (B) 2, 3 and 1 (C) 1, 3 and 2 (D) 2, 1 and 3

60. A borrow pit soil has a dry density of 16 kN/m^3. How many cubic meters of this soil will be required to construct an embankment of 100 m^3 with a dry density of 17 kN/m^3.
(A) 94 (B) 106 (C) 100 (D) 90

61. If, instead of single drainage, the number of drainage faces is increased to two in responding soils, the rate of compression will be
(A) 4 times slower (B) 2 times slower
(C) 4 times faster (D) 2 times faster

62. For a sample of dry cohesionless soil with friction angle, Ø, the failure plane will be inclined to the major principal plane by an angle equal to
(A) Ø (B) 45°
(C) $45^\circ - Ø/2$ (D) $45^\circ + Ø/2$

63. A sample of saturated cohesionless soil tested in a drained triaxial compression test showed an angle of internal friction of 30^0. The deviator stress at failure for the sample at a confining pressure of 200 kPa is equal to
(A) 200 kPa (B) 400 kPa (C) 600 kPa (D) 800 kPa

64. The appropriate field test to determine the in-situ undrained shear strength of a soft clay is
(A) Standard Penetration Test (B) Plate Load Test
(C) Static Cone Penetration Test (D) Vane Shear Test

65. A river 5 m deep consists of a sand bed with saturated unit weight of 20 kN/m^3, γ_w = 10 kN/m^3. The effective vertical stress at 5 m from the top of sand bed is
(A) 40 kN/m^2 (B) 50 kN/m^2 (C) 100 kN/m^2 (D) 150 kN/m^2

66. The lateral earth pressure coefficients of a soil, K_a for active state, K_p for passive state and K_o for at rest condition, compare as :
(A) $K_o < K_a < K_p$ (B) $K_a < K_o < K_p$ (C) $K_a < K_p < K_o$ (D) $K_p < K_o < K_a$

67. Which of the following factors affect the bearing capacity of cohesive soils ?
1. Density of soil
2. Angle of internal friction of soil
3. Depth of footing
4. Width of footing
(A) 1, 2 and 3 (B) 1, 2 and 4 (C) 2, 3 and 4 (D) 1, 2, 3 and 4

68. Amongst the clay minerals, the one having the maximum swelling tendency is
(A) Kaolinite (B) Montmorillonite
(C) Illite (D) Halloysite

69. Sand drains are used to
(A) reduce the settlement (B) accelerate the consolidation
(C) increase the permeability (D) transfer the load

70. Consider the following statements :
1. Friction piles are also called floating piles
2. Minimum number of piles to qualify as a pile group is three
3. The group efficiency of a pile group may be either less than 100% or more than 100%

Which of these statements are correct ?
(A) 1, 2 and 3 (B) 1 and 2 only
(C) 2 and 3 only (D) 1 and 3 only

71. Surface tension is due to
(A) cohesion (B) adhesion
(C) cohesion and adhesion (D) cohesion or adhesion

72. The Bernoulli's equation is applicable to
(A) both steady and unsteady flows
(B) real fluids
(C) all fluids and flows along a stream tube
(D) steady flow of ideal fluids along a stream tube

73. If a water jet of area 0.02 m^2 strikes at 10 m/s normally on a stationary plate, the force exerted on the plate is
(A) 200 N (B) 1000 N (C) 2000 N (D) 20000 N

74. The loss of head in a pipe carrying turbulent flow varies
(A) inversely as the square of the velocity of flow
(B) inversely as the square of the diameter of pipe
(C) directly as the square of the velocity of flow
(D) directly as the velocity of flow

75. It is proposed to increase the discharge by 20% in a circular pipe carrying oil in laminar regime. If all other factors remain unchanged, power consumption to maintain the modified flow relative to the original flow would increase by
(A) 10% (B) 20% (C) 44% (D) 52%

76. The average drag coefficient for a laminar boundary layer over a flat plate was obtained as 0.018. If all other factors remain unchanged, and the length of the plate is increased by 4 times its original value, the average drag coefficient would change to
(A) 0.0036 (B) 0.0056 (C) 0.008 (D) 0.009

77. Singing of telephone wires in the wind occurs due to
(A) vibrations caused by birds (B) tensioning at the ends
(C) Magnus effect (D) generation of Karman vortex street

78. In an open-channel flow, for a given discharge
1. alternate depths are the depths having same kinetic energy
2. alternate depths are the depths having same specific energy
3. conjugate depths are the depths having same specific force
4. conjugate depths are the depths having same momentum force
Which of the above statements are correct?
(A) 1 and 3 (B) 2 and 3 (C) 1 and 4 (D) 2 and 4

79. For a hydraulically efficient triangular channel, the ratio of hydraulic radius to depth of flow is
(A) $1/2\sqrt{2}$ (B) $2\sqrt{2}$ (C) $\sqrt{2}$ (D) 1/2

80. Which of the following GVF profiles are drawdown profiles?

(A) M_1, S_1, C_1 (B) M_2, S_2, H_2, A_2

(C) M_3, S_3, H_3, A_3 (D) none of these

81. A hydraulic jump occurs when there is a break in grade from a

(A) mild to steep (B) steep to mild

(C) steep to steeper (D) mild to milder

82. Flow measurements with a Prandtl-Pitot tube showed that the tip readings varied only across the flow while the side-opening readings varied only in the direction flow. The type of flow is

(A) uniform irrotational (B) uniform rotational

(C) non-uniform irrotational (D) non-uniform rotational

83. In 1:100 model of a spillway, the discharge is 0.1 m^3/s. The corresponding discharge in the prototype in m^3/s is

(A) 10 (B) 100 (C) 1000 (D) 10000

84. Consider the following types of turbines

1. Francis
2. Pelton with a single jet
3. Kaplan

The sequence of these turbines in the increasing order of their specific speeds is

(A) 1, 3 and 2 (B) 2, 1 and 3 (C) 1, 2 and 3 (D) 2, 3 and 1

85. Two identical pumps, each capable of delivering 0.2 cumec against a head of 30 m, are connected in parallel. The resulting discharge is

(A) 0.4 cumec against a head of 30 m

(B) 0.4 cumec against a head of 60 m

(C) 0.2 cumec against a head of 30 m

(D) 0.2 cumec against a head of 60 m

86. The rainfall on four successive days over a catchment are 2, 6, 9 and 5 cm. If Ø = 5 cm/day, the direct runoff from the catchment is

(A) 2 cm (B) 5 cm (C) 6 cm (D) 9 cm

87. If the peak of a 2 h unit hydrograph is 20 m^3/s, the peak ordinate of a flood hydrograph due to an effective rainfall of 2 cm of 2 hour duration with a base flow 5 m^3/s is

(A) 25 m^3/s (B) 30 m^3/s (C) 40 m^3/s (D) 45 m^3/s

88. A water shed of area 100 ha has a runoff coefficient of 0.4. A storm of duration larger than the time of concentration of the watershed and of intensity 3.6 cm/h carries a peak discharge of

(A) 0.4 m^3/s (B) 4 m^3/s (C) 36 m^3/s (D) 40 m^3/s

89. The volume of water that can be extracted by force of gravity from a unit volume of aquifer material is called

(A) specific yield (B) specific retention
(C) specific storage (D) specific capacity

90. A flood wave with a known inflow hydrograph is routed through a large uncontrolled reservoir. The outflow hydrograph will have

(A) attenuated peak with reduced time base
(B) attenuated peak with increased time base
(C) increased peak with increased time base
(D) increased peak with reduced time base

91. In an irrigated land , the net irrigation requirement of a crop is found to be 14 cm, the water application efficiency is 80% and the water conveyance efficiency is 70%. The gross irrigation requirement is

(A) 25 cm (B) 20 cm (C) 18.67 cm (D) 17.5 cm

92. A canal irrigates a cultural command area to grow sugarcane and wheat. The average discharges required to grow them are 0.36 and 0.27 respectively. The time factor is 0.9. The required discharge of the canal is

(A) 0.36 cumec (B) 0.40 cumec
(C) 0.63 cumec (D) 0.70 cumec

93. For a clayey soil, when there is nearly 50% drop in the available moisture, the ratio of actual to potential evapotranspiration is

(A) 1.0 (B) 0.7 (C) 0.5 (D) 0.2

94. Two different channels, M and N, in two different sites are designed based on Lacey's theory, to carry the same quantum of discharge. But the bed material of M is found to be finer than that of N.

(A) Channel M will have steeper longitudinal slope
(B) Channel N will have steeper longitudinal slope
(C) Channels M and N can have same longitudinal slope
(D) Silting is more in M than in N

95. At the base of a gravity dam section, the vertical stress at the toe was found to be 2.4 MPa. If the downstream face of the dam has a slope of 0.707 horizontal : 1 vertical, and if there is no tail water, the maximum principal stress at the toe of the dam is

(A) 1.7 MPa (B) 2.4 MPa (C) 3.6 MPa (D) 4.8 MPa

96. In the treatment of 200000 lit/day of water, the amount of chlorine used is 12 kg/day. The residual chlorine after 10 minutes contact is 0.25 mg/l. The chlorine demand in kg per day is

(A) 10 (B) 5 (C) 12 (D) 7

97. The order of unit processes: rapid mixing(RM), flocculation(F), primary sedimentation(PS), secondary sedimentation(SS), chlorination(C) and rapid sand filtration(RSF) (first to last) commonly used in a convention water treatment plant is

(A) PS→RSF→F→RM→SS→C (B) PS→F→RM→RSF→SS→C

(C) PS→F→SS→RSF→RM→C (D) PS→RM→F→SS→RSF→C

98. MPN index is a measure of one of the following

(A) Coliform bacteria (B) BOD

(C) Dissolved oxygen content (D) Hardness

99. Aeration of water is done to remove

(A) suspended impurities (B) colour

(C) dissolved salts (D) dissolved gases

100. Blue baby disease in children is caused by the presence of excess

(A) chlorides (B) nitrates

(C) fluoride (D) lead

101. The water distribution mains are designed for

(A) maximum hourly demand (B) average hourly demand

(C) maximum daily demand (D) average daily demand

102. The alkalinity and the hardness of a water sample are 250 mg/l and 350 mg/l as $CaCO_3$, respectively. Then water has

(A) 350 mg/l carbonate hardness and zero non-carbonate hardness

(B) 250 mg/l carbonate hardness and zero non-carbonate hardness

(C) 250 mg/l carbonate hardness and 350 mg/l non-carbonate hardness

(D) 250 mg/l carbonate hardness and 100 mg/l non-carbonate hardness

103. A combined sewer is one which carries

(A) domestic sewage and storm water

(B) domestic sewage and industrial wastes

(C) domestic sewage and overhead flow

(D) domestic sewage, industrial wastes and storm water

104. The relationship between theoretical oxygen demand (TOD), biochemical oxygen demand (BOD) and chemical oxygen demand (COD) is given by

(A) TOD>BOD>COD (B) TOD>COD>BOD

(C) COD>BOD>TOD (D) BOD>COD>TOD

105. Critical factors for the activated sludge treatment process are

(A) maximum hourly flow rate

(B) maximum and minimum flow rates

(C) maximum hourly flow rate and maximum daily organic load

(D) minimum hourly flow rate and minimum daily organic load

106. The main constituents of gas generated during the anaerobic digestion of the sludge are

(A) carbon dioxide and methane

(B) methane and ethane

(C) carbon dioxide and carbon monoxide

(D) carbon monoxide and nitrogen

107. During temperature inversion in the atmosphere, air pollutants tend to

(A) accumulate above inversion layer (B) accumulate below inversion layer

(C) disperse laterally (D) disperse vertically

108. Ozone layer depletion is because of

(A) hydrocarbons (B) carbon monoxide

(C) chlorofluro carbons (D) carbon dioxide

109. The presence of organic matter as the significant portion of a solid waste indicates its suitability for

(A) land filling (B) composting

(C) incineration (D) pyrolysis

110. Two sources generate noise levels of 90 dB and 94 dB respectively. The cumulative effect of these noise levels on the human ear is

(A) <90 dB (B) 90 dB (C) 94 dB (D) >94 dB

111. The rate of super elevation for a horizontal curve of radius 500 m in a national highway for a design speed of 100 kmph is

(A) 0.04 (B) 0.063 (C) 0.07 (D) 0.70

112. Bitumen of grade 80/100 means

(A) Its penetration value is 8 mm

(B) its penetration value is 10 mm

(C) its penetration value is 8 to 10 mm

(D) its penetration value is 8 to 10 cm

113. The position of base course in a flexible pavement is
(A) over the sub-base
(B) below the sub-base
(C) over the sub-grade but below the sub-base
(D) over the wearing course when renewal of surface is needed

114. Traffic capacity is the
(A) ability of road way to accommodate traffic volume in terms of vehicles per hour
(B) number of vehicles occupying a unit length of road way at a given instant expressed as vehicles/km
(C) capacity of lane to accommodate the vehicles across the road
(D) maximum attainable speed of vehicles

115. When two roads with two-lane, two-way traffic cross at an uncontrolled intersection, the total number of potential major conflict points would be
(A) 4 (B) 16 (C) 24 (D) 32

116. The plan of a survey plotted to a scale of 10 m to 1 cm is reduced in such a way that a line originally 10 cm long now measures 9 cm. The area of the reduced plan is measured as 81 cm^2. The actual area of the survey in m^2 is
(A) 656 (B) 6561 (C) 1000 (D) 10,000

117. The whole circle bearing of line AB is 50^0 and of line BC is 120^0. The deflection angle at B from AB to BC is
(A) 50^0 (B) 70^0 (C) 110^0 (D) 120^0

118. The rise and fall method of reduction of level readings provides arithmetic check on
(A) Intermediate sights only
(B) back sights and fore sights
(C) back sights, intermediate sights and fore sights
(D) back sights and intermediate sights

119. After fixing the plane table to the tripod, the main operations needed at each plane table station are 1. Levelling 2. Orientation 3. Centering
The correct sequence of these operations is
(A) 3, 1, 2 (B) 1, 3, 2 (C) 1, 2, 3 (D) 2, 3, 1

120. R.L. of a floor is 200.490. Staff reading on the floor is 1.695 m. Reading on the staff held upside down against the bottom of the roof is 3.305 m. Height of the ceiling is
(A) 3.5 m (B) 4.0 m (C) 5.0 m (D) 6.0 m

SPACE FOR ROUGH WORK