A
SET

Booklet No. :

CE - 15

Civil Engineering

Duration of Test : 2 Hours **Max. Marks : 120**

Hall Ticket No.

Name of the Candidate : _____

Date of Examination : _____ **OMR Answer Sheet No. :** _____

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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 n simultaneous equations AX = 0 in n unknowns has nontrivial solution if

(A) $|A| \neq 1$ (B) $|A| < n$ (C) $|A| = 0$ (D) A^{-1} exists

2. One eigen vector of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ is X =

(A) $\begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$ (B) $\begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}$ (D) $\begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}$

3. The shortest distance of the plane $lx + my + nz = p$ from the origin is

(A) $\frac{p}{\sqrt{l^2+m^2+n^2}}$ (B) $\frac{p}{\sqrt{l+m+n}}$ (C) $\frac{1}{\sqrt{l^2+m^2+n^2}}$ (D) 0

4. If C is the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ then the value of $\frac{1}{2}\oint_C (xdy - ydx)$ is

(A) πab (B) $\frac{\pi ab}{2}$ (C) ab^2 (D) $\pi a^2 b$

5. The value of $\frac{1}{D^2-4}\sin^2 x$ is

(A) $-\frac{1}{4}\sin^2 x$ (B) $\frac{1}{8}+\cos 2x$ (C) none (D) $(-1)\frac{1}{8}+\frac{1}{16}\cos 2x$

6. The Laplace transform of $e^{2x} x^2$ is

(A) $\frac{1}{(s-2)^3}$ (B) $\frac{1}{(s+2)^3}$ (C) $\frac{2}{(s-2)^3}$ (D) $\frac{2}{(s+2)^3}$

7. The residue of the function $f(z)=\frac{z^2}{(z-1)^2(z+2)}$ at the pole $z = -2$ is

(A) $\frac{5}{9}$ (B) $-\frac{1}{2}$ (C) $\frac{4}{9}$ (D) 0

8. If a random variable X has the PDF $f(x) = (1-p)^{x-1}p$, $x = 1, 2, \ldots$ and $0 < p < 1$. Then the mean of X is

(A) $p + 1$ (B) $p^2 + p$ (C) p (D) 1

9. Monthly-breakdowns of a computer is a random variable having Poisson distribution with mean 2.0. The probability that the computer will function for a month without a breakdown is

(A) $e^{0.2}$ (B) $e^{-0.2}$ (C) 0.2 (D) 0

10. The condition for convergence of iteration scheme $x_{n+1} = x_n - \dfrac{f(x_n)}{f'(x_n)}$ is

(A) $f''(x_n) f(x_n) \le [f'(x_n)]^2$ (B) $f'(x_n) < 1$

(C) $f'(x_n) > 1$ (D) $f''(x_n) f(x_n) \ge [f'(x_n)]^2$

11. A simply supported beam PQ is subjected to a concentrated load at R, the centre of the span. The area of shear force diagram from P to R will give

(A) deflection at R
(B) shear force at R
(C) load at R
(D) difference between bending moment values at P and R

12. If the shear force at a section of a beam under bending is equal to zero, then the bending moment at the section is

(A) zero (B) maximum (C) minimum (D) minimum or maximum

13. Of the four elastic constants, Young's modulus, Bulk modulus, Rigidity modulus and Poisson's ratio, the number of constants required to be determined experimentally to obtain the rest are

(A) one (B) two (C) three (D) four

14. Two bars of different materials are of the same size and are subjected to same tensile forces. If the bars have unit elongations in the ratio of 4:5, then the ratio of moduli of elasticity of the two materials is

(A) 5:4 (B) 4:5 (C) 4:9 (D) 16:25

15. The major and minor principal stresses at a point are 5 MPa (compressive) and 3 MPa (tensile) respectively. The maximum shear stress at the point is

(A) zero (B) 2 MPa (C) 4 MPa (D) 8 MPa

16. A Mohr's circle reduces a point when the body is subjected to

(A) pure shear
(B) uniaxial stress only
(C) equal and opposite normal stresses on two mutually perpendicular planes, which are free of shear
(D) equal normal stresses on two mutually perpendicular planes, which are free of shear

17. The ratio of maximum shear stress to average shear stress of a rectangular beam section to that of a circular beam section is in the proportion of

(A) 9:8 (B) 8:9 (C) 3:4 (D) 2:3

18. In a water pipe, if water freezes, the wall of the pipe is subjected to

(A) uniform hoop compression

(B) uniform hoop tension

(C) compression inside and tension outside

(D) compression outside and tension inside

19. A solid circular shaft of 6m length is built in at its ends and subjected to an externally applied torque 60 kN m at a distance of 2 m from the left end. The reactive torques at the left end and the right end are respectively

(A) 20 kN m and 40 kN m (B) 40 kN m and 20 kN m

(C) 30 kN m and 30 kN m (D) 15 kN m and 45 kN m

20. When both ends of a column are fixed, the crippling load is P. If one end of the column is made free, the value of crippling load is

(A) P/16 (B) P/4 (C) P/2 (D) 4P

21. If a three hinged parabolic arch carries a uniformly distributed load over the entire span, then any section of the arch is subjected to

(A) normal thrust only

(B) normal thrust and shear force

(C) normal thrust and bending moment

(D) normal thrust, shear force and bending moment

22. A simply supported beam with a rectangular cross-section is subjected to a concentrated load at the centre. If the width and depth of the beam are doubled, then the deflection at the centre of the beam will be reduced to

(A) 50% (B) 25% (C) 12.5% (D) 6.25%

23. The force method in structural analysis ensures

(A) compatibility of deformations (B) kinematically admissible strains

(C) equilibrium of forces (D) safety

24. The kinematic indeterminacy of a single portal frame fixed at the base is

(A) one (B) two (C) three (D) zero

25. The ratio of the moment-carrying capacities of a beam of a square section of size D and a beam of circular section of diameter D is

(A) $3\pi/8$ (B) $8/3\pi$ (C) $16/3\pi$ (D) $3\pi/16$

26. The maximum bending moment under a particular point load among a train of point loads crossing a simply supported girded occurs when that load is

(A) at mid-span

(B) at one-third span

(C) at one-quarter span

(D) so placed that the load point and the point of CG of the train of loads are equidistant from the mid-span

27. A propped cantilever beam of span L is loaded with a uniformly distributed load of intensity w/unit length all through the span, the bending moment at the fixed end is

(A) $wL^2/8$ (B) $wL^2/2$ (C) $wL^2/12$ (D) $wL^2/24$

28. A fixed beam of 6 m span supports two point loads of 300 kN each at 2 m and 4 m from one end. The bending moment under each load is

(A) 400 kN m (B) 300 kN m (C) 250 kN m (D) 200 kN m

29. Strength of concrete increases with

(A) increase in water-cement ratio (B) increase in fineness of cement

(C) decrease in curing time (D) decrease in size of aggregate

30. Factors of safety for steel and concrete in RCC should be based on

(A) yield stress and ultimate stress respectively

(B) ultimate stress and yield stress respectively

(C) yield stress

(D) ultimate stress

31. In the limit state method, balanced design of a reinforced concrete beam gives

(A) smallest concrete section and maximum area of reinforcement

(B) largest concrete section and maximum area of reinforcement

(C) smallest concrete section and minimum area of reinforcement

(D) largest concrete section and minimum area of reinforcement

32. Minimum clear cover in mm to the main steel bars in slab, beam, column and footing respectively, are

(A) 10, 15, 20 and 25 (B) 15, 25, 40 and 75

(C) 15, 25, 30 and 40 (D) 20, 35, 40 and 75

33. The following two statements are made with reference to a simply supported under-reinforced RCC beam :

I. Failure takes place by crushing of concrete before the steel has yielded.

II. The neutral axis moves up as the load is increased.

Of the statements

(A) I and II are false (B) I is true but II is false

(C) I and II are true (D) I is false but II is true

34. For a two-way slab, limiting deflection of the slab is

(A) a function of the short span (B) a function of the long span

(C) independent of the spans (D) dependent on both the spans

35. A simply supported rectangular beam is uniformly loaded and is pre-stressed. The tendon provided for pre-stressing should be

(A) straight, above centroidal axis (B) straight, below centroidal axis

(C) parabolic, convexity upward (D) parabolic, convexity downward

36. The maximum slenderness ratio of a compression member carrying both dead and superimposed load is

(A) 180 (B) 200 (C) 250 (D) 350

37. Generally the purlins are placed at the panel points so as to avoid

(A) axial force in rafter (B) shear force in rafter

(C) deflection in rafter (D) bending moment in rafter

38. Lacing bars in steel columns should be designed to resist

(A) bending moment due to 2.5% of the column load

(B) shear force due to 2.5% of the column load

(C) 2.5% of the column load

(D) shear force and bending moment due to 2.5% of the column load

39. In a plate girder, the web is primarily designed to resist

(A) torsional moment (B) shear force

(C) bending moment (D) diagonal buckling

40. The sections when arranged in the decreasing order of their shape factors are

(A) I, circular, diamond, rectangular (B) circular, I, rectangular, diamond

(C) diamond circular, rectangular, I (D) diamond, I, circular, rectangular

41. Loess is an aeolain deposit consisting of

(A) fine sand – size particles (B) clay-size particles

(C) silt- size particles (D) colloidal particles

42. The void ratio of a soil sample is 1, the porosity of the sample is

(A) 0.2 (B) 0.3 (C) 0.4 (D) 0.5

43. The porosity of a certain sample was found to be 80% and its specific gravity is 2.7, the critical hydraulic gradient is

(A) 0.34 (B) 0.92 (C) 1.0 (D) 1.5

44. On analysis of particle size distribution of a soil, it is found that $D_{10} = 0.1$ mm, $D_{30} = 0.3$ mm and $D_{60} = 0.8$ mm. The uniformity coefficient and curvature coefficient are respectively

(A) 8 and 3 (B) 2.67 and 1.125
(C) 2.67 and 3 (D) 8 and 1.125

45. In a wet soil mass, air occupies one-fourth of its volume and water occupies one-half of its volume. The void ratio of the soil is

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

46. The liquid limit (LL), plastic limit (PL) and shrinkage limit (SL), of a cohesive soil satisfy the relation

(A) LL>PL<SL (B) LL>PL>SL (C) LL<PL<SL (D) LL<PL>SL

47. A flow net under a sheet pile has $N_f = 4$, $N_d = 8$ and $K_H = 8 \times 10^{-5}$ m/s and $K_V = 2 \times 10^{-5}$ m/s. If the head loss through the soil is 2 m, the quantity of seepage per metre length of the pile is

(A) 2×10^{-5} m^3/s (B) 4×10^{-5} m^3/s (C) 8×10^{-5} m^3/s (D) 16×10^{-5} m^3/s

48. In a saturated clay with a unit weight of 20 kN/m^3, if the water table is at ground surface, the effective stress at 3 m depth in kN/m^2, is

(A) 60 (B) – 66 (C) 30 (D) – 30

49. A 2 m thick clay will be 90% consolidated in 6 years. The time required to achieve the same degree of consolidation in a 8 m thick stratum of the same clay is

(A) 12 years (B) 48 years (C) 72 years (D) 96 years

50. The ratio of compactive effort provide in modified Proctor test to standard Proctor test is

(A) 2 (B) 2.5 (C) 3 (D) 4.5

51. In a tri-axial compression test

(1) failure occurs along the weakest plane
(2) the stress distribution on the failure plane is more uniform
(3) complete control of drainage is possible
(4) the stresses on the failure plane are directly measured

Of these statements,

(A) 1, 2 and 3 are correct (B) 2, 3 and 4 are correct
(C) 3, 4 and 1 are correct (D) 4, 1 and 2 are correct

52. Indicate the False statement.

In granular soils, the value of Φ' depends on the following factors :

(A) Degree of saturation
(B) State of compaction
(C) Coarseness of grains
(D) Particle shape and roughness of grain surfaces

53. The total active thrust on a vertical wall 3 m height retaining a horizontal sand backfill (unit weight = 20 kN/m^3, angle of internal friction = 30°), when the water table at the bottom of the wall is

(A) 30 kN/m (B) 35 kN/m (C) 45 kN/m (D) 75 kN/m

54. The stability of upstream and downstream slopes of an earth dam has to be checked for

(A) steady seepage condition

(B) sudden drawdown condition

(C) steady seepage and sudden drawdown conditions respectively

(D) sudden drawdown and steady seepage conditions respectively

55. The gross bearing capacity of a footing is 440 kN/m^2. If the footing is 1.5 m wide and is at a depth of 1m in a clayey soil which has a unit weight of 20 kN/m^3, the safe bearing capacity with a factor of safety of 3 is

(A) 133 kN/m^2 (B) 140 kN/m^2 (C) 160 kN/m^2 (D) 420 kN/m^2

56. The ratio of ultimate bearing capacities of circular footing and a square footing founded on the surface of a purely cohesionless soil (the side of the square footing being equal to the diameter of the circular footing) is

(A) 0.75 (B) 1.0 (C) 1.33 (D) 1.75

57. Ultimate settlement of footings on cohesive soils is best estimated using the data from

(A) plate load test (B) consolidation test

(C) cone penetration test (D) standard penetration test

58. A 30 cm square bearing plate settles by 1.5 cm in a plate loading test on a cohesive soil when the intensity of loading is 200 kN/m^2. The settlement of prototype shallow footing 1m square under the same intensity of loading is

(A) 1.5 cm (B) 3 cm (C) 5 cm (D) 16.67 cm

59. A pile of 50 cm diameter and 10 m long is embedded in a deposit of fully saturated clay. The unconfined compressive strength of clay is 120 kN/m^2. The skin friction capacity (kN) of the pile for an adhesion factor of 0.6, is

(A) 671 kN (B) 565 kN (C) 283 kN (D) 106 kN

60. Negative skin friction can be developed from

1. a cohesive fill placed over a cohesionless soil deposit
2. a cohesionless fill placed over a compressible cohesive deposit
3. lowering of ground water table with resulting ground subsidence

Which of the above are correct ?

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

61. Choose the correct statement :

(A) Viscosity of liquids increases with increase in temperature

(B) Viscosity of liquids decreases with increase in temperature

(C) Viscosity of gases decreases with increase in temperature

(D) Viscosity of liquids and gases does not change with temperature

62. The velocities at two points in a pipeline are V and 3V. Both the points are at the same elevation. The fluid density is ρ. The flow can be assumed to be incompressible, inviscid, steady and irrotational. The difference in pressures between the points is

(A) ρV^2 (B) $2\rho V^2$ (C) $4\rho V^2$ (D) $8\rho V^2$

63. If the Reynolds number of pipe flow is 640, the friction factor of the pipe material is

(A) 0.16 (B) 0.1 (C) 0.016 (D) 0.01

64. The ratio of head loss per unit length of a pipe flowing full to that of the same pipe flowing half-full at the same mean velocity is

(A) 0.25 (B) 0.5 (C) 1 (D) 2

65. In network of pipes

(A) the algebraic sum of head (pressure and datum) drops around each circuit is zero

(B) the algebraic sum of discharges around each circuit is zero

(C) the algebraic sums of head (pressure and datum) drops and discharges around each circuit are zero

(D) the elevation of hydraulic gradient line is assumed for each junction point

66. The thickness of laminar boundary layer on a flat plate at a point P is 1 cm and at a point Q, 1 m downstream of P, is 2 cm. The distance of P from the leading edge of the plate is

(A) 0.33 m (B) 0.67 m (C) 1 m (D) 1.25 m

67. Uniform flow occurs in an open channel when there is a balance between

(A) gravity and frictional forces (B) gravity and inertial forces

(C) inertial and frictional forces (D) inertial and viscous forces

68. For a critical flow in an open channel

(A) specific energy and specific force are minimum for a given discharge

(B) specific energy is maximum for a given discharge

(C) specific force is maximum for a given discharge

(D) specific energy and specific force are maximum for a given discharge

69. In a channel the bed slope changes from a mild slope to a steep slope. The resulting gradually varied flow profiles are

(A) M_1, S_2 (B) M_2, S_1 (C) M_2, S_2 (D) M_1, S_1

70. The flow in a rectangular channel is subcritical. If the width is constricted at a certain section by a smooth transition, under unchoked flow condition, the water surface

(A) at the downstream section will rise (B) at the downstream section will drop

(C) at the upstream section will rise (D) at the upstream section will drop

71. The sequent depth ratio of a hydraulic jump in a horizontal rectangular channel is 5. The Froude number before the jump is

(A) $\sqrt{5}$ (B) $\sqrt{15}$ (C) $\sqrt{35}$ (D) $\sqrt{120}$

72. While conducting flow measurement using a rectangular notch, an error of 2% in head over the notch and an error of –1% in length of notch occurred, then the percentage of error in discharge would be

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

73. The number of π-parameters needed to express the function, F (A,V, t, ν, L) = 0 are

(A) 5 (B) 4 (C) 3 (D) 2

74. If the flow patterns represented by $\Psi_1 = x^2 + y^2$ and $\Psi_2 = 2xy$ are superposed on one another, the resulting flow pattern can be represented by a family of

(A) parallel straight lines (B) circles

(C) parabolas (D) hyperabolas

75. Identify the correct statement :

(A) Pumps operating in series boost the discharge and pumps operating in parallel boost the head

(B) Pumps operating in series boost the head and pumps operating in parallel boost the discharge

(C) Pumps operating either in series or in parallel boost the discharge

(D) Pumps operating either in series or in parallel boost the head

76. A line connecting points having equal time of travel of surface runoff to the catchment outlet is an

(A) isochrone (B) isovel (C) isopleth (D) isohyet

77. The method used to check the consistency of raingauge record is

(A) normal ratio (B) double mass curve

(C) moving average (D) Thiessen polygon

78. A 6 h storm had 6 cm of rainfall at uniform rate and the resulting runoff was 3 cm. If the Φ – index remains at the same value, the runoff due to 12 cm of uniform rainfall in 9 hours in the catchment is

(A) 9 cm (B) 4.5 cm (C) 6 cm (D) 7.5 cm

79. Identify an indirect method of stream gauging from the following :

(A) moving-boat method (B) electromagnetic method

(C) ultrasonic method (D) slope-area method

80. For a catchment with an area of 200 km^2, the equilibrium discharge of the S – curve obtained by summation of 2 h unit hydrographs is

(A) 36 m^3/s (B) 100 m^3/s (C) 278 m^3/s (D) 400 m^3/s

81. A 2 h unit hydrograph of a catchment is triangular in shape with a base of 20 hours and a peak of 100 m^3/s. The unit hydrograph refers to a catchment area of

(A) 0.36 km^2 (B) 3.6 km^2 (C) 36 km^2 (D) 360 km^2

82. A culvert is designed for a peak flow of 10 m^3/s on the basis of rational formula. If the storm of same intensity as used in the design but of duration thrice larger occurs, the resulting peak discharge is

(A) 3.33 m^3/s (B) 5 m^3/s (C) 10 m^3/s (D) 30 m^3/s

83. A linear reservoir is one in which the

(A) storage varies linearly with elevation

(B) storage varies linearly with the outflow rate

(C) storage varies linearly with time

(D) storage varies linearly with the inflow rate

84. The volume stored in a saturated column of aquifer with a porosity of 0.3, cross-sectional area of 2 m^2 and of 4 m depth is

(A) 1.2 m^3 (B) 2.4 m^3 (C) 4 m^3 (D) 8 m^3

85. If duty is 1200 hectares/cumec and base period is 120 days for an irrigated crop, then delta is

(A) 0.864 m (B) 0.432 m (C) 1 m (D) 10 m

86. Lysimeter and Tensiometer are used to measure respectively, one of the following groups of quantities

(A) evaporation and permeability

(B) capillary potential and evapotranspiration

(C) evapotranspiration and capillary potential

(D) velocity and vapour pressure

87. Lacey's waterway for a discharge of 100 m^3/s and a silt factor of 1 is

(A) 10.25 m (B) 47.5 m (C) 90.75 m (D) 111 m

88. Base width of elementary profile of a gravity dam of 15 m high, built of material of specific gravity 2.25 and resisting only hydrostatic force is

(A) 6.67 m (B) 10 m (C) 13.42 m (D) 15 m

89. According to Khosla's theory, the exit gradient in the absence of downstream cutoff is

(A) zero (B) unity (C) zero or unity (D) infinity

90. A sprinkler irrigation system is suitable when

(A) the land gradient is steep and the soil is easily erodible

(B) the soil is having low permeability

(C) the water table is low

(D) the crops to be grown have deep roots

91. Use of coagulants such as alum

(A) results in reduction of pH of the treated water

(B) results in increase of pH of the treated water

(C) results in no change in pH of the treated water

(D) may cause an increase or decrease of pH of the treated water

92. Hardness in water is caused by

(A) Nitrates (B) Fluorides

(C) Sodium chloride (D) Calcium and Magnesium

93. A water treatment plant treats 6000 m^3 of water per day. If it consumes 20 kg chlorine per day, then the chlorine dosage would be

(A) 3 mg/l (B) 3.75 mg/l (C) 4.25 mg/l (D) 3.33 mg/l

94. The maximum permissible quantity of lead in water for drinking purpose is

(A) 0.01 ppm (B) 1 ppm (C) 0.5 ppm (D) 0.1 ppm

95. The device used to measure the odour of water is

(A) Jackson's turbidimeter (B) Thermometer

(C) Hydrometer (D) Osmoscope

96. Which of the following operational problems relate to the functioning of rapid gravity filter ?

1. Inadequate media comprising filter bed
2. Mud balls
3. Negative head

Which of the above are correct ?

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

97. Which of the following reasons are responsible for adoption of post-chlorination of water ?

1. Chlorine demand is reduced.
2. Possibility of taste and odour formation is reduced.
3. Possibility of formation of carcinogenic compounds is reduced.
4. Chloramines are formed.

(A) 1, 2, 3 and 4 (B) 1, 2 and 3 only
(C) 1 and 4 only (D) 2, 3 and 4 only

98. The most suitable method of analysis of water distribution system for long and narrow pipe system is

(A) Circle method (B) Equivalent pipe method
(C) Hardy-Cross method (D) Electrical analyser method

99. Sewage treatment units are normally designed for

(A) 5 – 10 years (B) 15 – 20 years (C) 30 – 40 years (D) 40 – 50 years

100. Most suitable section of sewer for both combined and separate systems is

(A) semi-elliptical (B) circular
(C) horse-shoe shaped (D) egg shaped

101. If the slope of sewer A is 1/400 and that of sewer B is 1/100, the velocity of flow in the two sewers will have a ratio of (other parameters being same)

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

102. During sewage treatment, effluent from which one of the following treatment units has minimum amount of suspended solids ?

(A) Detritus channel (B) Primary sedimentation tank
(C) Secondary sedimentation tank (D) Activated sludge process aeration tank

103. The drop manholes are provided in a sewerage system when there is

(A) change in alignment of sewer line
(B) change in size of sewers
(C) change in the elevation of ground level
(D) change from gravity to pressure system

104. The unit in which both sedimentation and digestion processes of sludge take place simultaneously is

(A) Skimming tank (B) Imhoff tank
(C) Detritus tank (D) Digestion tank

105. A sewage sludge has a water content of 99%. The concentration of suspended solids in the sludge is

(A) 10 mg/l (B) 100 mg/l (C) 1000 mg/l (D) 10,000 mg/l

106. Consider the following statements :

1. Noise pollution can be reduced using double – glass window panes
2. Glass absorbs noise
3. The air trapped in the double – glass system acts as an insulator and reduces the noise
4. The noise totally reflects back due to two layers of glass

Which of these statements are correct ?

(A) 1, 2, 3 and 4 (B) 1, 2 and 3 only
(C) 1 and 3 only (D) 2 and 4 only

107. A water supply of 15,000 m^3 per day is treated with 0.5 ppm of chlorine. The requirement of 30% bleaching powder per day is

(A) 2.25 kg (B) 4.5 kg (C) 2.5 kg (D) 25 kg

108. Greenhouse effect is considered to be due to the increased levels of

(A) Carbon monoxide (B) Carbon dioxide
(C) Sulphur dioxide (D) Chloroflurocarbons

109. Large calorific value of solid wastes indicates its amenability for

(A) composting (B) incineration (C) pyrolysis (D) land filling

110. The secondary pollutant among the air pollutants, NO, SO_2, soot and O_3, is

(A) NO (B) SO_2 (C) soot (D) O_3

111. Camber in highway pavement is provided to take care of

(A) centrifugal force (B) drainage
(C) sight distance (D) off-tracking

112. Two bitumen samples P and Q have softening points 45° C and 60° C respectively. Consider the following statements :

I. Viscosity of P will be lesser than that of Q at the same temperature
II. Penetration value of P will be more than that of Q under standard conditions

The correct option evaluating the above statements is

(A) Both I and II are TRUE (B) Both I and II are FALSE
(C) I is FALSE and II is TRUE (D) I is TRUE and II is FALSE

113. In a flexible pavement

(A) vertical compressive stresses decrease with depth of the layer
(B) vertical compressive stress is maximum at the lowest layer
(C) tensile stresses get developed
(D) maximum stress induced by a given traffic load is dependent on the location of load on the pavement surface

114. Traffic density is the

(A) ability of roadway to accommodate traffic volume in terms of vehicles/hr.

(B) number of vehicles occupying a length of roadway at a given instant expressed as vehicles/km.

(C) capacity of lane to accommodate the vehicles widthwise (across the road).

(D) maximum attainable speed of vehicle.

115. At an intersection, the critical lane volume on the major road increases while that on the minor road remains unchanged. The green time for the signal will

(A) increase for the major road and remain same for the minor road.

(B) increase for the major road and decrease for the minor road.

(C) decrease for both the roads.

(D) remain unchanged for both the roads.

116. The bearings of lines OP and OQ are 20° 30" and 342° 20" respectively. The included angle QOP is

(A) 321° 50" (B) 162° 20" (C) 69° 30" (D) 38° 10"

117. Reciprocal levelling eliminates the

1. errors due to earth's curvature
2. errors due to atmospheric refraction
3. mistakes in taking levelling staff readings
4. errors due to line of collimation

Which of the statements given above are correct ?

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

118. The closing error in a traverse survey can be eliminated by

(A) Bowditch rule

(B) transit rule

(C) working accurately latitudes

(D) either Bowditch rule or transit rule as applicable

119. The plotting of inaccessible points in a plane-table survey can be done by the method of

(A) Interpolation (B) Radiation (C) Intersection (D) Traversing

120. A 3% downgrade curve is followed by a 1% upgrade curve and rate of change of grade adopted is 0.1% per 20 m length. The length of respective vertical curve is

(A) 800 m (B) 200 m (C) 100 m (D) 400 m

SPACE FOR ROUGH WORK