(CVL)

CIVIL ENGINEERING

INSTRUCTIONS TO CANDIDATES

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2. Immediately on opening this Question Paper Booklet, check:
   (a) Whether **200** multiple choice questions are printed (**50** questions in Mathematics, **25** questions in Physics, **25** questions in Chemistry and **100** questions in Engineering)
   (b) In case of any discrepancy immediately exchange the Question paper Booklet of same code by bringing the error to the notice of invigilator.
3. Use of Calculators, Mathematical Tables and Log books is not permitted.
4. **Candidate must ensure that he/she has received the Correct Question Booklet, corresponding to his/her branch of Engineering.**
5. **Candidate should ensure that the booklet Code and the Booklet Serial Number, as it appears on this page is entered at the appropriate place on the OMR Response Sheet by shading the appropriate circles provided therein using H.B. pencil only. Candidate should note that if they fail to enter the Booklet Serial Number and the Booklet Code on the OMR Response Sheet, their Answer Sheet will not be valued.**
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9. Rough work should be done only in the space provided in the Question Paper Booklet.
10. No loose sheets or papers will be allowed in the examination hall.
11. Timings of Test: 10.00 A.M. to 1.00 P.M.
12. Candidate should ensure that he / she enters his / her name and appends signature on the Question paper booklet, leaflet attached to this question paper booklet and also on the OMR Response Sheet in the space provided. Candidate should ensure that the invigilator puts his signature on this question paper booklet, leaflet attached to the question paper booklet and also on the OMR Response Sheet.
13. Before leaving the examination hall candidate should **return both the OMR Response Sheet and the leaflet attached to this question paper booklet** to the invigilator. Failure to return any of the above shall be construed as malpractice in the examination. **Question paper booklet may be retained by the candidate.**
14. This booklet contains a total of **32** pages including Cover page and the pages for Rough Work.

MATHEMATICS

1. If $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then $A^4 =$

(1) 3I (2) 9I (3) 27I (4) 81I

2. If $A = \begin{bmatrix} 0 & 2 & 1 \\ -2 & 0 & -2 \\ -1 & x & 0 \end{bmatrix}$ is a skew symmetric matrix, then the value of x is

(1) 1 (2) 2 (3) 3 (4) 4

3. What is the number of all possible matrices with each entry as 0 or 1 if the order of matrices is 3×3

(1) 64 (2) 268 (3) 512 (4) 256

4. If $A = \begin{bmatrix} 1 & i & -i \\ i & -i & 1 \\ -i & 1 & i \end{bmatrix}$, then $|A| =$

(1) 1 (2) 2 (3) 3 (4) 4

Set Code : T2
Booklet Code : A

5. The solution of a system of linear equations $2x - y + 3z = 9, x + y + z = 6, x - y + z = 2$ is

(1) $x = -1, y = -2, z = -3$ (2) $x = 3, y = 2, z = 1$

(3) $x = 2, y = 1, z = 3$ (4) $x = 1, y = 2, z = 3$

6. If $\frac{1}{x^2 + a^2} = \frac{A}{x + ai} + \frac{B}{x - ai}$ then A = __________, B = __________.

(1) $\frac{1}{2ai}, -\frac{1}{2ai}$ (2) $-\frac{1}{2ai}, \frac{1}{2ai}$ (3) $\frac{1}{ai}, -\frac{1}{ai}$ (4) $-\frac{1}{ai}, \frac{1}{ai}$

7. If $\frac{2x+4}{(x-1)^3} = \frac{A_1}{(x-1)} + \frac{A_2}{(x-1)^2} + \frac{A_3}{(x-1)^3}$ then $\sum_{i=1}^{3} A_i$ is equal to

(1) A_2 (2) $2A_2$ (3) $4A_2$ (4) $4A_1$

8. The period of the function $f(x) = |\sin x|$ is

(1) π (2) 2π (3) 3π (4) 4π

9. If A+B=45°, then (1−cotA) . (1−cotB) is

(1) 1 (2) 0 (3) 2 (4) −1

10. The value of sin 78° + cos 132° is

(1) $\frac{\sqrt{5}+1}{4}$ (2) $\frac{\sqrt{5}+1}{2}$ (3) $\frac{\sqrt{5}-1}{2}$ (4) $\frac{\sqrt{5}-1}{4}$

11. If A+B+C = π, then sin2A + sin2B + sin2C =

(1) 4 cosA sinB cosC (2) 4 sinA cosB sinC

(3) 4 cosA cosB cosC (4) 4 sinA sinB sinC

12. The principal solution of Tan$x$ = 0 is

(1) $x = n\pi, n \in Z$ (2) $x=0$

(3) $x=(2n+1)\pi/2, n \in Z$ (4) $x = n\pi+\alpha, n \in Z$

Set Code : T2

Booklet Code : A

13. The value of $\mathrm{Tan}^{-1}(2) + \mathrm{Tan}^{-1}(3)$ is

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{3}$ (4) $\frac{3\pi}{4}$

14. If the sides of a right angle triangle are in A.P., then the ratio of its sides is

(1) 1:2:3 (2) 2:3:4 (3) 3:4:5 (4) 4:5:6

15. The value of $r.r_1.r_2.r_3$ is

(1) Δ^2 (2) Δ^{-2} (3) Δ^{-3} (4) Δ^4

16. $\frac{1}{r1}+\frac{1}{r2}+\frac{1}{r3}=$

(1) $\frac{1}{r}$ (2) $\frac{1}{2r}$ (3) $\frac{1}{R}$ (4) $\frac{1}{\Delta}$

17. If a=6, b=5, c=9, then the value of angle A is

(1) $\cos^{-1}$ (2/9) (2) $\cos^{-1}$ (2/5) (3) $\cos^{-1}$ (7/9) (4) $\cos^{-1}$ (1/3)

18. The polar form of complex number $1-i$ is

(1) $\sqrt{2}\,e^{-i\pi/4}$ (2) $\sqrt{2}\,e^{i\pi/4}$ (3) $\sqrt{2}\,e^{i\pi/2}$ (4) $\sqrt{2}\,e^{-i\pi/2}$

19. If 1, ω, ω^2 be the cube roots of unity, then the value of $2^{\omega^2}.2^{\omega^5}.2^{\omega}$ is

(1) ω (2) ω^2 (3) 1 (4) 0

20. The intercept made on X-axis by the circle $x^2+y^2+2gx+2fy+c=0$ is

(1) $\sqrt{g^2-c}$ (2) $\sqrt{f^2-c}$ (3) $2.\sqrt{g^2-c}$ (4) $2.\sqrt{f^2-c}$

21. If one end of the diameter of the circle $x^2+y^2-5x-8y+13=0$ is (2, 7), then the other end of the diameter is

(1) (3, 1) (2) (1, 3) (3) (–3, –1) (4) (–1, –3)

Set Code : T2

Booklet Code : A

22. The radius of the circle $\sqrt{1+m^2}(x^2+y^2)-2cx-2mcy=0$ is

(1) $2c$ (2) $4c$ (3) $c/2$ (4) c

23. The parametric equations of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ are

(1) $x=a\sec\theta, y=b\tan\theta$ (2) $x=b\sin\theta, y=a\cos\theta$

(3) $x=a\cos\theta, y=b\sin\theta$ (4) $x=a\operatorname{cosec}\theta, y=b\cot\theta$

24. The equation of the directrix of the parabola $2x^2=-7y$ is

(1) $8y+7=0$ (2) $8y-7=0$ (3) $7y+8=0$ (4) $8x-7=0$

25. The condition for a straight line $y=mx+c$ to be a tangent to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is

(1) $c=a/m$ (2) $c^2=a^2m^2-b^2$ (3) $c^2=a^2m^2+b^2$ (4) $c^2=a/m$

26. $\underset{x\to 1}{Lt}\frac{\sqrt{5x-4}-\sqrt{x}}{x-1}$ is

(1) 3 (2) 2 (3) 4 (4) 1

27. $\log i=$

(1) $\pi/2$ (2) $\pi/4$ (3) $i\pi/2$ (4) $i\pi/4$

28. $\frac{d}{dx}[\log_7 X]=$

(1) $\frac{1}{x}$ (2) $X\log_7^e$ (3) $\frac{1}{x}\log^7_e$ (4) $\frac{1}{x}\log_7^e$

29. $\frac{d}{dx}[2\cosh x]=$

(1) $\frac{e^x+e^{-x}}{2}$ (2) $\frac{e^x-e^{-x}}{2}$ (3) e^x+e^{-x} (4) e^x-e^{-x}

Set Code : T2

Booklet Code : A

30. $\frac{d}{dx}\left[\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)\right]=$

(1) $\frac{1}{1+x^2}$ (2) $\frac{-1}{1+x^2}$ (3) $\frac{2}{1+x^2}$ (4) $\frac{-2}{1+x^2}$

31. If $x = at^2, y = 2at$, then $\frac{dy}{dx}=$

(1) $\sqrt{\frac{y}{x}}$ (2) $\sqrt{\frac{x}{a}}$ (3) $\sqrt{\frac{a}{x}}$ (4) $\sqrt{\frac{x}{y}}$

32. The derivative of e^x with respect to $\sqrt{x}$ is

(1) $\frac{2\sqrt{x}}{e^x}$ (2) $2\sqrt{x}\,e^x$ (3) $\frac{e^x}{2\sqrt{x}}$ (4) $\sqrt{x}\,e^x$

33. The equation of the normal to the curve $y = 5x^4$ at the point (1, 5) is

(1) $x + 20y = 99$ (2) $x + 20y = 101$ (3) $x - 20y = 99$ (4) $x - 20y = 101$

34. The angle between the curves $y^2 = 4x$ and $x^2 + y^2 = 5$ is

(1) $\frac{\pi}{4}$ (2) $\tan^{-1}(2)$ (3) $\tan^{-1}(3)$ (4) $\tan^{-1}(4)$

35. If $u = x^3y^3$ then $\frac{\partial^3 u}{\partial x^3}+\frac{\partial^3 u}{\partial y^3}=$

(1) $6\,(x^3+y^3)$ (2) $6\,x^3\,y^3$ (3) $6x^3$ (4) $6y^3$

36. $\int \operatorname{cosec} x\, dx=$

(1) $\log(\operatorname{cosec} x + \cot x) + C$

(2) $\log(\cot x/2) + C$

(3) $\log(\tan x/2) + C$

(4) $-\operatorname{cosec} x.\cot x + C$

Set Code : T2

Booklet Code : A

37. $\int_0^{\frac{\pi}{2}} \cos^{11} x\, dx =$

(1) $\frac{256}{693}$ (2) $\frac{256\pi}{693}$ (3) $\frac{\pi}{4}$ (4) $\frac{128}{693}$

38. $\int f^1(x).[f(x)]^n\, dx =$

(1) $\frac{[f(x)]^{n-1}}{n-1}+C$ (2) $\frac{[f(x)]^{n+1}}{n+1}+C$ (3) $n[f(x)]^{n-1}+C$ (4) $(n+1)[f(x)]^{n+1}+C$

39. $\int \frac{dx}{(x+7)\sqrt{x+6}} =$

(1) $Tan^{-1}(\sqrt{x+6})+C$

(2) $2Tan^{-1}(\sqrt{x+6})+C$

(3) $Tan^{-1}(x+7)+C$

(4) $2Tan^{-1}(x+7)+C$

40. $\int \tan^{-1} x\, dx =$

(1) $x.Tan^{-1}x+\frac{1}{2}\log(1+x^2)+C$

(2) $\frac{1}{1+x^2}+C$

(3) $x^2.Tan^{-1}x+C$

(4) $x.Tan^{-1}x-\log\sqrt{1+x^2}+C$

41. $\int \frac{dx}{1+e^{-x}} =$

(1) $\log(1+e^{-x})+C$

(2) $\log(1+e^{x})+C$

(3) $e^{-x}+C$

(4) $e^{x}+C$

42. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \sin|x|\, dx =$

(1) 0 (2) 1 (3) 2 (4) −1

Set Code : T2
Booklet Code : A

43. Area under the curve $f(x) = \sin x$ in $[0, \pi]$ is
(1) 4 sq. units (2) 2 sq. units (3) 6 sq. units (4) 8 sq. units

44. The order of $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} - 3y = x$ is
(1) 1 (2) 4 (3) 3 (4) 2

45. The degree of $\left[\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = a\frac{d^2y}{dx^2}$ is
(1) 4 (2) 2 (3) 1 (4) 3

46. The family of straight lines passing through the origin is represented by the differential equation
(1) $ydx + xdy = 0$ (2) $xdy - ydx = 0$ (3) $xdx + ydy = 0$ (4) $xdx - ydy = 0$

47. The differential equitation $\frac{dy}{dx} + \frac{ax + hy + g}{hx + by + f} = 0$ is called
(1) Homogeneous (2) Exact (3) Linear (4) Legender

48. The solution of differential equation $\frac{dy}{dx} = e^{-x^2} - 2xy$ is
(1) $y.e^{-x^2} = x + c$ (2) $ye^{x} = x + c$ (3) $ye^{x^2} = x + c$ (4) $y = x + c$

49. The complementary function of $(D^3+D^2+D+1)\,y = 10$ is
(1) $C_1\cos x + C_2\sin x + C_3e^{-x}$ (2) $C_1\cos x + C_2\sin x + C_3e^{x}$
(3) $C_1 + C_2\cos x + C_3\sin x$ (4) $(C_1 + C_2x + C_3x^2)\,e^{x}$

50. Particular Integral of $(D-1)^4y = e^x$ is
(1) $x^4 e^x$ (2) $\frac{x^4}{24}e^{-x}$ (3) $\frac{x^4}{12}e^{x}$ (4) $\frac{x^4}{24}e^{x}$

Set Code : T2

Booklet Code : A

PHYSICS

51. Two quantities A and B are related by the relation A/B = m where m is linear mass density and A is force. The dimensions of B will be

(1) same as that of latent heat (2) same as that of pressure

(3) same as that of work (4) same as that of momentum

52. The dimensional formula of capacitance in terms of M, L, T and I is

(1) $[ML^2T^2I^2]$ (2) $[ML^{-2}T^4I^2]$ (3) $[M^{-1}L^3T^3I]$ (4) $[M^{-1}L^{-2}T^4I^2]$

53. If l, m and n are the direction cosines of a vector, then

(1) $l + m + n = 1$ (2) $l^2 + m^2 + n^2 = 1$ (3) $\frac{1}{l}+\frac{1}{m}+\frac{1}{n}=1$ (4) $lmn = 1$

54. The angle between i+j and j+k is

(1) 0° (2) 90° (3) 45° (4) 60°

55. A particle is moving eastwards with a velocity of 5 ms^{-1}. In 10 seconds the velocity changes to 5 ms^{-1} northwards. The average acceleration in this time is

(1) $\frac{1}{\sqrt{2}}$ ms^{-2} towards north-west (2) zero

(3) $\frac{1}{2}$ ms^{-2} towards north (4) $\frac{1}{\sqrt{2}}$ ms^{-2} towards north-east

56. The linear momentum of a particle varies with time t as $p = a+bt+ct^2$ which of the following is correct?

(1) Force varies with time in a quadratic manner.

(2) Force is time-dependent.

(3) The velocity of the particle is proportional to time.

(4) The displacement of the particle is proportional to t.

57. A shell of mass m moving with a velocity v suddenly explodes into two pieces. One part of mass m/4 remains stationary. The velocity of the other part is

(1) v (2) $2v$ (3) $3v/4$ (4) $4v/3$

58. The velocity of a freely falling body after 2s is
(1) 9.8 ms^{-1} (2) 10.2 ms^{-1} (3) 18.6 ms^{-1} (4) 19.6 ms^{-1}

59. A large number of bullets are fired in all directions with the same speed u. The maximum area on the ground on which these bullets will spread is
(1) $\frac{\pi u^2}{g^2}$ (2) $\frac{\pi u^4}{g^2}$ (3) $\frac{\pi u^2}{g^4}$ (4) $\frac{\pi u}{g^4}$

60. The minimum stopping distance for a car of mass m, moving with a speed v along a level road, if the coefficient of friction between the tyres and the road is μ, will be
(1) $\frac{v^2}{2\mu g}$ (2) $\frac{v^2}{\mu g}$ (3) $\frac{v^2}{4\mu g}$ (4) $\frac{v}{2\mu g}$

61. When a bicycle is in motion, the force of friction excreted by the ground on the two wheels is such that it acts
(1) In the backward direction on the front wheel and in the forward direction on the rear wheel
(2) In the forward direction on the front wheel and in the backward direction on the rear wheel
(3) In the backward direction on both the front and the rear wheels
(4) In the forward direction on both the front and the rear wheels

62. In a perfectly inelastic collision, the two bodies
(1) strike and explode (2) explode without striking
(3) implode and explode (4) combine and move together

63. Under the action of a constant force, a particle is experiencing a constant acceleration, then the power is
(1) zero (2) positive
(3) negative (4) increasing uniformly with time

64. Consider the following two statements:

A : Linear momentum of a system of particles is zero.

B : Kinetic energy of a system of particles is zero.

Then

(1) A implies B & B implies A
(2) A does not imply B & B does not imply A
(3) A implies B but B does not imply A
(4) A does not imply B but B implies A

65. An engine develops 10 kW of power. How much time will it take to lift a mass of 200 kg to a height of 40 m? (Given g = 10 ms^{-2})

(1) 4s (2) 5s (3) 8s (4) 10s

66. If a spring has time period T, and is cut into n equal parts, then the time period will be

(1) $T\sqrt{n}$ (2) $\frac{T}{\sqrt{n}}$ (3) nT (4) T

67. When temperature increases, the frequency of a tuning fork

(1) increases
(2) decreases
(3) remains same
(4) increases or decreases depending on the materials

68. If a simple harmonic motion is represented by $\frac{d^2x}{dy^2} + \alpha x = 0$, its time period is

(1) $2\pi\sqrt{\alpha}$ (2) $2\pi\alpha$ (3) $\frac{2\pi}{\sqrt{\alpha}}$ (4) $\frac{2\pi}{\alpha}$

69. A cinema hall has volume of 7500 m^3. It is required to have reverberation time of 1.5 seconds. The total absorption in the hall should be

(1) 850 w-m^2 (2) 82.50 w-m^2 (3) 8.250 w-m^2 (4) 0.825 w-m^2

70. To absorb the sound in a hall which of the following are used

(1) Glasses, stores (2) Carpets, curtains
(3) Polished surfaces (4) Platforms

71. If N represents avagadro's number, then the number of molecules in 6 gm of hydrogen at NTP is

(1) 2N (2) 3N (3) N (4) N/6

72. The mean translational kinetic energy of a perfect gas molecule at the temperature T K is

(1) $\frac{1}{2}kT$ (2) kT (3) $\frac{3}{2}kT$ (4) $2kT$

73. The amount of heat given to a body which raises its temperature by 1°C

(1) water equivalent (2) thermal heat capacity
(3) specific heat (4) temperature gradient

74. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio Cp/Cv for gas is

(1) $\frac{3}{2}$ (2) $\frac{4}{3}$ (3) 2 (4) $\frac{5}{3}$

75. Cladding in the optical fiber is mainly used to

(1) to protect the fiber from mechanical stresses
(2) to protect the fiber from corrosion
(3) to protect the fiber from mechanical strength
(4) to protect the fiber from electromagnetic guidance

Set Code : T2

Booklet Code : A

CHEMISTRY

76. The valency electronic configuration of Phosphorous atom (At.No. 15) is

(1) $3s^2\ 3p^3$ (2) $3s^1\ 3p^3\ 3d^1$ (3) $3s^2\ 3p^2\ 3d^1$ (4) $3s^1\ 3p^2\ 3d^2$

77. An element 'A' of At.No.12 combines with an element 'B' of At.No.17. The compound formed is

(1) covalent AB (2) ionic AB_2 (3) covalent AB_2 (4) ionic AB

78. The number of neutrons present in the atom of ${}_{56}Ba^{137}$ is

(1) 56 (2) 137 (3) 193 (4) 81

79. Hydrogen bonding in water molecule is responsible for

(1) decrease in its freezing point (2) increase in its degree of ionization

(3) increase in its boiling point (4) decrease in its boiling point

80. In the HCl molecule, the bonding between hydrogen and chlorine is

(1) purely covalent (2) purely ionic (3) polar covalent (4) complex coordinate

81. Potassium metal and potassium ions

(1) both react with water (2) have the same number of protons

(3) both react with chlorine gas (4) have the same electronic configuration

82. 5.85 gms of sodium chloride were dissolved in water and the solution made upto 100 ml in a standard flask. 10 ml of this solution were pipetted out into another flask and made up with distilled water into 100 ml of solution. The concentration of the sodium chloride solution now is

(1) 0.1 M (2) 1.0 M (3) 0.5 M (4) 0.25 M

83. Concentration of a 1.0 M solution of phosphoric acid in water is

(1) 0.33 N (2) 1.0 N (3) 2.0 N (4) 3.0 N

84. Which of the following is a Lewis acid?

(1) Ammonia (2) Berylium chloride

(3) Boron trifluoride (4) Magnesium oxide

Set Code : T2
Booklet Code : A

85. Which of the following constitutes the components of a buffer solution?
(1) Potassium chloride and potassium hydroxide
(2) Sodium acetate and acetic acid
(3) Magnesium sulphate and sulphuric acid
(4) Calcium chloride and calcium acetate

86. Which of the following is an electrolyte?
(1) Acetic acid (2) Glucose (3) Urea (4) Pyridine

87. Calculate the Standard emf of the cell, $Cd/Cd^{+2}//Cu^{+2}/Cu$ given that E^0 Cd/Cd^{+2} = 0.44V and E^0 Cu/Cu^{+2} = (–) 0.34 V.
(1) (–) 1.0 V (2) 1.0 V (3) (–) 0.78 V (4) 0.78 V

88. A solution of nickel chloride was electrolysed using Platinum electrodes. After electrolysis,
(1) nickel will be deposited on the anode (2) Cl_2 gas will be liberated at the cathode
(3) H_2 gas will be liberated at the anode (4) nickel will be deposited on the cathode

89. Which of the following metals will undergo oxidation fastest?
(1) Cu (2) Li (3) Zinc (4) Iron

90. Which of the following cannot be used for the sterilization of drinking water?
(1) Ozone (2) Calcium Oxychloride
(3) Potassium Chloride (4) Chlorine water

91. A water sample showed it to contain 1.20 mg/litre of magnesium sulphate. Then, its hardness in terms of calcium carbonate equivalent is
(1) 1.0 ppm (2) 1.20 ppm (3) 0.60 ppm (4) 2.40 ppm

92. Soda used in the L-S process for softening of water is, Chemically.
(1) sodium bicarbonate (2) sodium carbonate decahydrate
(3) sodium carbonate (4) sodium hydroxide (40%)

93. The process of cementation with zinc powder is known as
(1) sherardizing (2) zincing (3) metal cladding (4) electroplating

94. Carrosion of a metal is fastest in
(1) rain-water (2) acidulated water (3) distilled water (4) de-ionised water

95. Which of the following is a thermoset polymer?
(1) Polystyrene (2) PVC
(3) Polythene (4) Urea-formaldehyde resin

96. Chemically, neoprene is
(1) polyvinyl benzene (2) polyacetylene
(3) polychloroprene (4) poly-1,3-butadiene

97. Vulcanization involves heating of raw rubber with
(1) selenium element (2) elemental sulphur
(3) a mixture of Se and elemental sulphur (4) a mixture of selenium and sulphur dioxide

98. Petrol largely contains
(1) a mixture of unsaturated hydrocarbons C_5 - C_8
(2) a mixture of benzene, toluene and xylene
(3) a mixture of saturated hydrocarbons C_{12} - C_{14}
(4) a mixture of saturated hydrocarbons C_6 - C_8

99. Which of the following gases is largely responsible for acid-rain?
(1) SO_2 & NO_2 (2) CO_2 & water vapour
(3) CO_2 & N_2 (4) N_2 & CO_2

100. BOD stands for
(1) Biogenetic Oxygen Demand (2) Biometric Oxygen Demand
(3) Biological Oxygen Demand (4) Biospecific Oxygen Demand

Set Code : T2

Booklet Code : A

CIVIL ENGINEERING

101. Stress strain curve is always a straight line for
   (1) Elastic materials
   (2) materials obeying Hook's law
   (3) Elasto-plastic materials
   (4) plastic materials

102. The maximum value of Poisson's for an elastic material is
   (1) 0.25
   (2) 0.5
   (3) 0.75
   (4) 1.0

103. The stress at which extension of a material takes place more quickly as compared to the increase in load is called
   (1) Elastic point
   (2) Plastic point
   (3) Breaking point
   (4) Yielding point

104. For ductile materials, the most appropriate failure theory is
   (1) maximum shear stress theory
   (2) maximum principal stress theory
   (3) maximum principal strain theory
   (4) shear strain energy theory

105. The materials which have the same elastic properties is in all directions are
   (1) Brittle material
   (2) Homogeneous material
   (3) Isotropic material
   (4) Hard material

106. An elastic bar of length 'l', cross sectional area A, Young's modulus of elasticity E and self weight W is having vertically, it is subjected to load applied axially at the bottom end. The total elongation of the bar is given by
   (1) Wl/AE + Pl/AE
   (2) Wl/2AE + Pl/AE
   (3) Wl/2AE + Pl/2AE
   (4) Wl/AE + PL/2AE

107. The bending moment diagram is a cubic parabola for a cantilever
    (1) subjected to triangular load varying from zero at free end to maximum at fixed end
    (2) with free end subjected to a moment
    (3) subjected to uniformly distributed load
    (4) subjected to concentrated load at the free end

108. For a simply supported beam with central load, the Bending Moment will be
    (1) Least at the centre (2) least at the supports
    (3) maximum at the supports (4) maximum at the centre

109. The B.M on a section is maximum when shearing force
    (1) is maximum (2) is minimum (3) is equal (4) changes sign

110. The deflection due to couple M at the free end of a cantilever of length L is
    (1) ML/EI (2) 2ML/EI (3) $ML^2/2EI$ (4) $M^2L/2EI$

111. The shear force on a simply supported beam is proportional to
    (1) displacement of the neutral axis (2) sum of the forces
    (3) algebraic sum of transverse forces (4) algebraic sum of axial forces

112. The shape of the bending moment diagram over the length of a beam, having no external load is always
    (1) parabolic (2) cubical (3) linear (4) circular

113. The ratio of maximum to average shear stress in a solid circular section is
    (1) 1.0 (2) 1.33 (3) 1.5 (4) 1.7

114. The Poison's ratio for cork is
    (1) zero (2) 0.1 (3) 0.2 (4) 0.3

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115. The sum of the moment of inertias about any two orthogonal axes is
(1) always constant (2) always zero
(3) always one (4) always linear

116. Strain energy in torsion of a shaft per unit volume is given by considering 'q' as shear stress, E modulus of elasticity and G as modulus of rigidity
(1) $q^2/2G$ (2) $q^2/2E$ (3) $q/4G$ (4) $q/4E$

117. The maximum shear stress in a thin tube is
(1) equal to average shear stress (2) twice the average shear stress
(3) half the average shear stress (4) one third of average shear stress

118. Macaulay's method is used for calculation of which quantity
(1) bending moment (2) shear force
(3) slope and deflection (4) stresses

119. Along the neutral axis of simply supported beam
(1) fibers do not undergo strain (2) fibers undergo minimum strain
(3) fibers undergo maximum strain (4) fibers undergo minimum stress

120. The area under stress strain curve represents
(1) work done (2) ductility (3) strain energy (4) residual stress

121. The maximum deflection of a cantilever beam due to pure bending moment (M) at its free end is
(1) $Ml^2/3EI$ (2) $Ml^2/4EI$ (3) $Ml^2/6EI$ (4) $Ml^2/2EI$

122. The shape of kern area of a rectangular section is
(1) rectangle (2) square (3) rhombus (4) parallelogram

123. Polar modulus of a section is a measure of strength of section in
(1) bending (2) shear (3) torsion (4) axial compression

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Booklet Code : A

124. Thick cylinders are analysed on the basis of
(1) maximum shear stress theory (2) Lame's theory
(3) Poisson's theory (4) Rankine's theory

125. When one end of a fixed beam deflects by 'δ' then the bending moment at deflected end is
(1) $\frac{2EI\delta}{L^2}$ (2) $\frac{3EI\delta}{L}$ (3) $\frac{3EI\delta}{L^2}$ (4) $\frac{6EI\delta}{L^2}$

126. The flexural rigidity of a hinged end is
(1) infinity (2) zero (3) two (4) one

127. Buckling load can be greater than crushing load if
(1) column is a short column (2) column has both ends fixed
(3) column is a long one (4) column both ends hinged

128. For a column of length 'L' having one end fixed and other end free, the equivalent length is
(1) 2L (2) L (3) L/2 (4) $L/\sqrt{2}$

129. The ratio of crippling loads of a column having both the ends fixed and the column whose both the ends are hinged, is
(1) 1.0 (2) 2.0 (3) 3.0 (4) 4.0

130. The maximum height of a masonry dam of a triangular section whose base width is 'b' and specific gravity 's' is
(1) $b\sqrt{s}$ (2) b.s (3) $\sqrt{b}.\sqrt{s}$ (4) $s\sqrt{b}$

131. The failure wedge develops when a retaining wall
(1) moves away from the backfill
(2) moves towards backfill
(3) sink downwards
(4) stresses equally by vertical and horizontal forces

132. The lateral earth pressure on a retaining wall
   (1) is equal to mass of the soil retained
   (2) proportional to the depth of the soil
   (3) proportional to the square of the depth of the soil
   (4) proportional to the internal friction of the soil

133. Modulus of rapture of concrete is a measure of
   (1) flexural tensile strength
   (2) direct tensile strength
   (3) compressive strength
   (4) both flexural & tensile strength

134. The fineness modulus of fine aggregate is in the range of
   (1) 2.0 to 3.5 (2) 3.5 to 5.0 (3) 5.0 to 7.0 (4) 7.0 to 10.0

135. For making a good concrete, aggregate should be in
   (1) saturated condition
   (2) surface dry condition
   (3) bone dry condition
   (4) semi saturated condition

136. For reinforced cement concrete the slump should be
   (1) 0 to 5 cm (2) 2.5 to 7.5 cm (3) 7.5 to 10 cm (4) 5 to 12.5 cm

137. The ratio of tensile to compressive strength of concrete is
   (1) 0.025 (2) 0.04 (3) 0.1 (4) 0.4

138. Design mix concrete is preferred over nominal mix concrete because
   (1) strength of former is more
   (2) cement content of later is more
   (3) it is easy to prepare former at site
   (4) strength of later is less

139. Which of the following does not cause unsoundness in cement
   (1) free lime
   (2) magnesia
   (3) calcium sulphate
   (4) silica

Set Code : T2

Booklet Code : A

140. The partial safety factor for steel as per IS 456-2000 is taken as

(1) 1.15 (2) 1.25 (3) 1.50 (4) 1.75

141. In working stress design, the factor of safety is applied on

(1) ultimate stress (2) yield stress

(3) stress at elastic limit (4) breaking stress

142. In a RCC column if ties are not provided, the column is likely to

(1) fail by buckling (2) fail by crushing

(3) behave like a beam (4) fail by torsion

143. To design a column, one should normally start by assuming the area of steel as

(1) 1% (2) 0.15% (3) 0.5% (4) 0.75%

144. Which of the following is generally not designed for shear

(1) a slab (2) a cantilever beam

(3) a footing (4) a beam

145. The maximum shear stress in a beam of rectangular section is given by

(1) 1.25 times the average (2) 1.5 times the average

(3) 1.75 times the average (4) 2.0 times the average

146. The radius of a bar bend to form a hook, should not be less than

(1) twice the diameter (2) thrice the diameter

(3) four times the diameter (4) five times the diameter

147. Increase in fineness modulus of aggregate indicates

(1) fine grading (2) coarser grading

(3) gap grading (4) mixed grading

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Booklet Code : A

148. In slab, the minimum reinforcement provided is (for Fe 250 Grade)
(1) 0.10% of its gross sectional area (2) 0.12% of its gross sectional area
(3) 0.15% of its gross sectional area (4) 0.18% of its gross sectional area

149. The diameter of longitudinal bars of a column should never be less than
(1) 6 mm (2) 8 mm (3) 10 mm (4) 12 mm

150. A column is regarded as long column if the ratio of its effective length and lateral dimension exceeds
(1) 10 (2) 12 (3) 20 (4) 25

151. The shear reinforcement in RCC is provided to resist
(1) vertical shear (2) horizontal shear
(3) diagonal compression (4) diagonal tension

152. The maximum ratio of span to depth of a slab simple supported and spanning in two direction, is
(1) 25 (2) 30 (3) 35 (4) 40

153. If concrete grade is M-20 then what would be the modular ratio
(1) 7.08 (2) 9.08 (3) 12 (4) 13.33

154. For stairs spanning horizontally the minimum waist provided is
(1) 4 cm (2) 6 cm (3) 10 cm (4) 12 cm

155. If T and R are tread and rise respectively of a stair, then
(1) $2R + T = 60$ (2) $R + 2T = 60$ (3) $2R + T = 30$ (4) $R + 2T = 30$

156. Invar tape is made of an alloy of ______ and steel.
(1) Copper (2) Zinc (3) Nickel (4) Bronze

Set Code : T2

Booklet Code : A

157. Walking over the area and observing its main features and boundaries, is known as _____ survey.
(1) Topographical (2) Cadastral (3) City (4) Reconnaissance

158. The sum of the exterior angles of a closed traverse is equal to _______ Right angles, where n is the number of its sides.
(1) $(2n-4)$ (2) $(2n+4)$ (3) $(4n-2)$ (4) $(4n+2)$

159. If the whole circle bearing of a line is 270°, then its bearing in quadrantal system is
(1) 90°W (2) 90°E (3) 180°W (4) 180°E

160. A line which passes through the optical centre of the objective and also through the intersection of the cross hair, is called ________
(1) Line of collimation (2) Axis of telescope
(3) Horizontal axis (4) Trunion axis

161. If R.L. of a B.M. is 200.00 m, back sight is 1.525 m and foresight is 3.285 m, R.L. of the forward station, is ________
(1) 198.460m (2) 201.760m (3) 198.240m (4) 201.525m

162. In trapezoidal formula of areas, the line joining the ends of the ordinates is assumed _______
(1) semi circular (2) straight (3) parabolic (4) circular

163. 1 Acre is equal to
(1) 43560 sq.ft (2) 34560 sq.ft (3) 54360 sq.ft (4) 64350 sq.ft

164. If a tacheometer is fitted with anallatic lens
(1) Additive constant is 100, multiplying constant is 0
(2) Additive constant is 0, multiplying constant is 100
(3) Both additive constant and multiplying constant are 100
(4) Both additive constant and multiplying constant are 50

Set Code : T2

Booklet Code : A

165. One S.I. unit of viscosity is equal to

(1) 10 poises (2) 981 poises (3) 9.81 Ns/m^2 (4) 10 $kg.sec/m^2$

166. 8 m of oil (sp.Gr. = 0.8) head is equal to the following water head

(1) 10 m (2) 8 m (3) 6.4 m (4) 1 m

167. A vertical triangular area of altitude h has one side in the free surface of a liquid. Its vertex is downward. The depth of its centre of pressure is

(1) 0.8 h (2) 0.75 h (3) 0.5 h (4) h/3

168. The equation of continuity

(1) is valid for incompressible fluids

(2) expresses the relation between mass and area of cross-section

(3) relates the density variations along a stream line

(4) relates the mass rate of flow along a stream tube

169. Flow of a fluid from low pressure to high pressure is

(1) possible in upward flow through a uniform vertical line

(2) possible in flow through a converging pipe with horizontal axis

(3) possible in flow through a diverging pipe with a horizontal axis

(4) impossible if the passage has a constant cross-section

170. Differential manometers are used for measuring

(1) velocity of fluid at a point

(2) pressure of fluid at a point

(3) discharge of fluid

(4) difference of pressure between two points

Set Code : T2

Booklet Code : A

171. The pressure at vena-contracta of an external mouthpiece is
   (1) always less than saturation vapor pressure of liquid
   (2) inversely proportional to square of coefficient of contraction
   (3) always greater than atmospheric pressure
   (4) a function of the head over the mouthpiece

172. A V-notch is considered to be a better notch because
   (1) its C_d is practically uniform over a wide range of heads
   (2) it produces negligible contraction of the nappe
   (3) It keeps the head within a reasonable limit even for large discharges
   (4) Its C_d is smaller

173. An error of 1 mm is committed in the measurement of head over a rectangular notch. If the head is 0.3m the percent error in discharge is
   (1) 0.5 (2) 0.6 (3) 1.0 (4) 1.5

174. The Hagen-Poiseuille equation gives
   (1) head loss in laminar flow
   (2) boundary shear stress in laminar flow
   (3) shear stress distribution in any pipe flow
   (4) velocity distribution in any pipe flow

175. The loss of head due to friction in turbulent flow through a circular pipe
   (1) varies as cube of average velocity (2) varies inversely as square of average velocity
   (3) varies as square of average velocity (4) is directly proportional to average velocity

176. Laminar flow through a pipe, the velocity distribution curve is
   (1) logarithmic (2) parabolic
   (3) elliptical (4) hyperbolic

Set Code : T2

Booklet Code : A

177. For the most economical trapezoidal section of an open channel
(1) depth of flow = twice base width
(2) depth of flow = hydraulic radius
(3) sloping side = half the top width
(4) sloping side = base width

178. Froude's number is defined as the ratio of
(1) Inertia force to viscous force
(2) Inertia force to elastic force
(3) Inertia force to pressure force
(4) Inertia force to gravity force

179. The critical velocity for a flow of q m^3 width of a wide rectangular channel is given by
(1) $\left(\frac{q^2}{g}\right)^{1/3}$
(2) $(q^2 g)^{1/3}$
(3) $\left(\frac{g}{q^2}\right)^{1/3}$
(4) $(q g)^{1/2}$

180. The function of scroll case of a reaction turbine is to
(1) Guide the water to the runner at appropriate angle
(2) Guide the water smoothly to the tailrace
(3) Distribute the water evenly around the wheel
(4) Reduce the eddy and shock losses

181. The runner blades of a Kaplan turbine are
(1) More curved than propeller blades
(2) More curved than pelton blades
(3) More curved than Francis blades
(4) Less curved than Francis blades

182. When the speed of a centrifugal pump is constant
(1) Shaft power decreases with increase of Q
(2) H_m decreases with increase of Q
(3) Q increases with increase of H_m
(4) Q is independent of H_m

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Booklet Code : A

183. The optical square is based on the principle of optical
   (1) reflection (2) refraction
   (3) double reflection (4) double refraction

184. A reservoir provided at the intake head works from which water enters the penstocks is
   (1) power canal (2) tail rack (3) fore bay (4) trash rack

185. Consumptive use is :
   (1) water used up in plant metabolism
   (2) sum of evapo-transpiration and amount used up in plant metabolism
   (3) sum of evapo-transpiration and infiltration losses
   (4) combined use of surface and ground water resources

186. The head under which a centrifugal pump works is called
   (1) piezometric head (2) pressure head
   (3) suction head (4) manometric head

187. The volume of water that can be extracted by force of gravity from a unit volume of aquifer material is known as
   (1) specific capacity (2) specific yield
   (3) specific retention (4) specific storage

188. One cumec day is equal to
   (1) 8.64 hectare metres (2) 86.4 hectare metres
   (3) 864 hectare metres (4) 0.864 hectare metres

189. Lacey considered channel section
   (1) Rectangular (2) Trapezoidal (3) Semi elliptical (4) Elliptical

Set Code : T2
Booklet Code : A

190. Land is said to be water logged when
(1) Gravity drainage is ceased
(2) Permanent wilting point is reached
(3) Salinity of soil increases
(4) Capillary fringe reaches root zone of plants

191. Hydraulic jump occurs when the flow changes from
(1) super critical to sub critical
(2) sub critical to super critical
(3) critical to turbulent
(4) laminar to turbulent

192. Streams that contribute to the ground water are called
(1) Effluent streams
(2) Ground water stream
(3) Influent streams
(4) Perennial stream

193. Rational method correlates
(1) Run off coefficient with intensity of rainfall
(2) Run off co efficient with drainage area
(3) Drainage area with intensity of rainfall
(4) Intensity of rainfall with run off

194. The example of multiple Arch type Buttress dam in India is
(1) Mir-Alam dam
(2) Khadakwasla Dam
(3) Idikki dam
(4) Koyna dam

195. Surcharge storage of reservoir is the volume of water stored between
(1) Normal pool level and maximum pool level
(2) Maximum pool level and minimum pool level
(3) Minimum pool level and normal pool level
(4) Normal pool level and revert bed level

196. Seepage endangers the stability of an earth dam built on pervious foundation because of piping which depends on
   (1) height of dam
   (2) quantity of seepage flow
   (3) value of exit gradient
   (4) total reservoir storage capacity

197. Inverted filter for providing foundation drainage has
   (1) multi layers of soil particles of same permeability
   (2) multi layers in which permeability increases from top to bottom
   (3) multi layers in which permeability increases from bottom to top
   (4) only one layer of soil

198. Gravity dams transfer load to foundation by
   (1) Arch action
   (2) Cantilever action
   (3) Both arch and cantilever action
   (4) Cohesion

199. A chute spill way is generally provided with
   (1) A weir
   (2) A barrage
   (3) Concrete gravity dam
   (4) An earth dam

200. The function of surge tank is to
   (1) avoid flow in reverse direction
   (2) smoothen the flow
   (3) act as a reservoir for emergency condition
   (4) relieve the pipe line of excessive pressure transients