SUB: CIVIL ENGINEERING (CE)

Instructions:
1. **Ensure that all pages are printed.**
2. **Use Black ball pen only**
3. **Change in option is not allowed**
4. **There is no negative marking**
5. **Use of non -programmable scientific calculator is allowed**

1. What is meaning of TMT bar?
   A   Tension metal treated bar   B   Thermo mechanically treated bar
   C   Thermo mechanically tension bar   D   None of these

2. A standard concrete cylinder of height 300 mm and 150 mm diameter, when tested under uni-axial compression test, observes 1 mm decrease in height over gauge length of 200 mm and 0.15 mm increase in diameter. The Poisson's ratio is
   A   0.0   B   0.2
   C   0.15   D   0.5

3. If an assembly of copper rod tightly fitted inside the steel tube, is heated beyond the standard temperature. Knowing that,$\alpha_c > \alpha_s$,then

   A   Rod will experience tension and tube will experience compression.   B   Both Rod and tube will experience compression.
   C   Rod will experience compression and tube will experience tension   D   Both Rod and tube will experience tension.

4. The qualitative shape of SFD for the cantilever beam loaded as shown below will be,
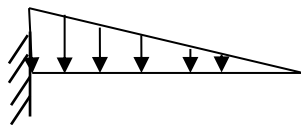
   A

   B

   C

   D

5. The load w which when acts at a free end of cantilever beam having flexural rigidity EI and span length L, causes deflection δ at free end. If same load acts at a centre of a simply supported beam of same span and flexural rigidity, it will cause deflection at centre equal to…

   A   (1/48) δ   B   48δ

   C   (1/16) δ   D   16δ

6. Le Chatelier test is conducted to find..
   A Compressive strength of cement   B Setting time of cement
   C Specific gravity of cement   D Soundness of cement

7. According to sieve analysis, clay particles are having grain size
   A Less than 2 micron   B Less than 20 micron
   C Less than 75 micron   D Less than 475 micron

8. A shape factor of ISMB 250 about major axis will be approximately..
   A 1.00   B 1.50
   C 1.15   D 2.00

9. Which test is finally recommended to prove the adequacy of concrete element if results of previously done testing are not acceptable?
   A NDT test   B Load Test
   C Pull out test   D Pull of test

10. Hoop stress developed in a thin cylindrical shell by winding it by wires under tension circumferentially will be..
    A Compression   B Tension
    C Shear   D zero

11. The figure shown below represents the contact pressure distribution underneath.....
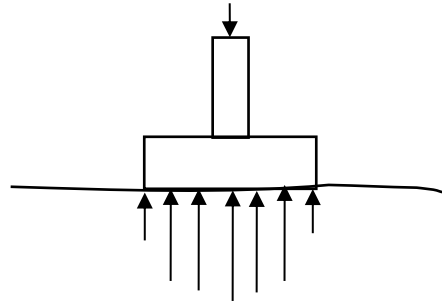
    A Rigid footing resting on saturated clay   B Flexible footing on saturated clay
    C Rigid footing resting on cohesion less soil   D Flexible footing resting on cohesion less soil

12. As per IS800, maximum value of a effective slenderness ratio for a member carrying compressive loads resulting from dead loads and imposed loads shall not exceed.
    A 250   B 200
    C 300   D 180

13. Which of the following steel plate section has maximum width to thickness ratio?
    A Slender   B Compact
    C Semi-Compact   D Plastic

14. Usually, for the post-tensioned simply supported girder, the ideal stress distribution across the mid span section at the service stage will be like.. (Note: C stands for compressive stress & T stands for tensile stress.)

A
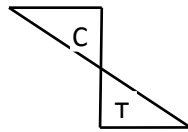
B
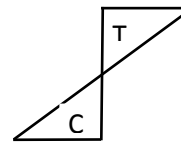
C
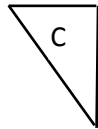
D
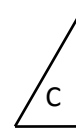
15. For three beams of effective span L and same flexural rigidity subjected to concentrated load 'W' applied at the centre of span, the collapse load Wc will be $k(M_p/L)$. If the beams are simply supported, propped cantilever and fixed, the values of k will respectively be
   A 4,6,8   B 4,8,6
   C 6,8,4   D 8,6,4

16. The unit for coefficient of sub-grade reaction is..
   A $kN/m^2/m$ B $kN/m/m^3$
   C $kN/m/m^2$ D $kN/m/m$

17. Under a pure torsion condition for a circular shaft, maximum shear stress will arise in the fiber located at...
   A Centre of the shaft   B Half radius away from the centre.
   C Outer surface   D None of these

18. The maximum bending moment due to train of wheel loads on a simply supported girder occurs…
   A Always under resultant of wheel loads   B Always under wheel load
   C Always at centre of span   D None of these

19. The state of stress at a point in a loaded member includes tensile stresses of magnitude 9 N/mm^2 and 9 N/mm^2 acting along x and y axes respectively accompanied by a shear stress of magnitude 3 N/mm^2.The magnitude of the principal stresses at a point will be..
   A 9 N/mm^2 tensile and 3 N/mm^2 tensile   B 12 N/mm^2 tensile and 6 N/mm^2 compressive
   C 12 N/mm^2 compressive and 6 N/mm^2 compressive   D 12N/mm^2 tensile and 6 N/mm^2 tensile

20. If the diameter of a circular column is'd', its Kernal (core) will have diameter..
   A d/3   B d/4
   C d/2   D d/6

21. As per IS 456, Nominal concrete mix may be used for…
   A Concrete grade M25 and below.   B Concrete grade M30 and below.
   C Concrete grade M20 and below.   D Concrete grade M15 and below.

22. According to IS: 456,the partial safety factor γ_f for the imposed load for the deflection check corresponding to load combination DL +IL shall be,
   A 1.2   B 0.8

C 1.5 D 1.0

23. A short cast iron cylindrical specimen subjected to uni-axial compression generally fails..

    A Along inclined plane   B By crushing
    C Along vertical plane   D Along horizontal plane

24. The correct ILD for the reaction at support A for the cantilever beam shown below is….

A

B

C

D
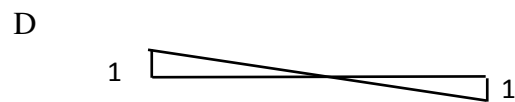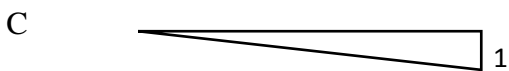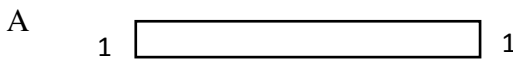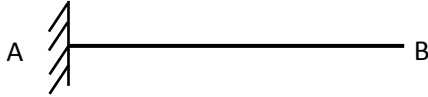
25. The external and internal Statical Indeterminacy of the truss structure shown in the figure below is respectively.

A 1 & 2 B 2 & 1

C 2 & 2 D 1&1

26. Force in the member BD of the truss shown in the figure below will be.

A 40 kN Tension B zero

C 20 kN compression D 20 kN Tension

27. If the gross ultimate bearing capacity of a strip footing 1.5m wide located at a depth of 1 m in a clay is 400 kN/m^2 , its net ultimate bearing capacity for γ=20 kN/m^2 is..

   A   370kN/m^2 B   420kN/m^2

   C   380kN/m^2 D   430kN/m^2

28. As per USC, SW and SC are classified as ..
   A   Well graded sands & clayey sands   B   Silty gravels & clayey gravels
   C   Well graded silts & silty clays   D   Poorly graded sands & silty sands

29. In the case of a cantilever retaining wall, main reinforcement for a toe slab is placed at..
   A   Bottom of the slab   B   Centre of the slab
   C   Top of the slab   D   Anywhere along thickness

30. for the soil with L_L=45%, P_L=25% and S_L=15%,the plasticity index is
   A   50%   B   20%
   C   40%   D   60%

31. For any soil sample..
   A   Porosity η and void ratio e are   B   Porosity η will be always less than
       always equal   void ratio e
   C   Porosity η will be always higher   D   None of these
       than void ratio e

32. A well graded sand should have
   A   Cu≥4.00   B   Cu≥3.00
   C   Cu≥1.00   D   Cu≥6.00

33. The width of broad gauge rails is…
   A   1.000m   B   0.762m
   C   1.676m   D   1.435m

34. To primary air pollutants are..
   A   Sulphur oxide and hydrocarbon   B   Sulphur oxide and ozone
   C   Nitrogen oxide and   D   Ozone and peroxyacetylnitrate
       peroxyacetylnitrate

35. CBR value of sub-grade soil is 5%.If 4100 kg wheel load and tyre pressure is 6 kg/cm2, thickness of pavement required will be (using U.S. corps formula).
   A   65.5 cm   B   55.5 cm
   C   35.5 cm   D   45.5 cm

36. Which of the following is the portable and very accurate hand equipment, mainly used for measuring angles from a boat in hydrographic surveying?
   A   sounding rod   B   sounding lead
   C   lead line   D   sextant

37. If Δ is angle of deflection of a simple curve of radius R, then length of tangent of a curve will be..
   A   лRΔ/270   B   лRΔ/180
   C   лRΔ/90   D   лRΔ/360

38. The unit of an area of hydrograph may be..
   A   sqmt   B   metre

C   cumecs   D   cum

39. In gravity dam, main overturning force is..
    A   uplift pressure   B   wind pressure
    C   water pressure   D   self weight of dam

40. Average BOD_5 of domestic sewage is..

    A   80 kg/person/day   B   0.8 kg/person/day
    C   8 kg/person/day   D   0.08 kg/person/day

41. 1 hectare is equal to..
    A $100 \ m^2$ B $1000 \ m^2$
    C $10000 \ m^2$ D $100000 \ m^2$

42. The difference between face left and face right observations of a theodolite is 2′. The error will be..
    A   2′   B   1′
    C   4′   D   0′

43. The line of collimation of a theodolite must be perpendicular to..
    A   Horizontal axis   B   Vertical axis
    C   Axis of plate level   D   Axis of altitude bubble

44. In case of road curve, the distance from the point of intersection to the tangent point is called..
    A   Apex distance   B   Length of curve
    C   Long chord   D   Tangent length

45. If N is the number of sides of a closed traverse, by included angle, the sum of measured interior angles should be equal to..
    A   (N-4)X90   B   (2N-1)X90
    C   (2N-4)X180   D   (2N-4)X90

46. Speed of 5 m/s is equivalent to
    A   5 km/h   B   18 km/h
    C   36 km/h   D   30 km/h

47. The shape of the stop sign as per IRC is..
    A   square   B   triangular
    C   circular   D   octagonal
48. Which of the following is leads to systematic error?
    A   mistake in reading   B   bad ranging
    C   wrong length of chain   D   Non of these
49. Aeration of water is done to remove
    A   Color   B   hardness
    C   turbidity   D   odour
50. Minimum D.O. prescribed for a river stream to avoid fish kill is..
    A   2 ppm   B   10 ppm
    C   8 ppm   D   4 ppm
51. Dicken's formula for high flood estimate is useful only for the catchments in
    A   southern India   B   western India
    C   Northern India   D   Eastern India

52. The peak of flood hydrograph due to a 4-h storm is $420 m^3/s$. The mean depth of rain fall is 7.0 cm. if average infiltration loss 0.25cm/h and constant base flow of 15 m^3/s, then the peak discharge of 4-h unit hydrograph for this catchment is..

    A $58.25 m^3/s$ B $60.65 m^3/s$

    C $67.50 m^3/s$ D $70.5 m^3/s$

53. The most desirable alignment of an irrigation canal is along

    A the ridge line   B the contour line

    C the valley line   D None of the above

54. The standard height of a standard rain gauge is

    A 10cm   B 30cm

    C 40cm   D 20cm

55. Following pattern of contour shown with RL represents…

    A Hill   B Ridge

    C valley   D pond

56. The toughness of road aggregate is measured by

    A Attrition test   B Abrasion test

    C Impact test   D Crushing Test

57. Pick up the correct order for following vehicle considering their Passenger Car Unit in ascending order.

a. Motor Cycle b. Truck   c. Bullock cart d. Auto rickshaw

    A d<a<c<b   B c<d<b<a

    C a<d<b<c   D a<c<d<b

58. Ruling minimum radius of a horizontal curve for a national highway in plain terrain for a ruling design speed of 80kmph considering e=0.07 and f=0.15 is approximately..

    A 300 m   B 320 m

    C 100 m   D 230 m

59. 60/70 Bitumen means

    A penetration value is 60 to 70   B ductility value is 60 to 70

    C softening point value 60 to 70   D None of the above

60. Number of vehicles occupying a unit length of lane of roadway at a given instant of time is called

    A traffic capacity   B traffic density

    C traffic speed   D traffic volume

61. In case of flexible pavement, correct order of layers from top to bottom is..

    A Wearing coarse, sub base coarse, base coarse, sub-grade

    B sub-grade, wearing coarse, base coarse, sub base coarse

    C base coarse, sub base coarse, sub-grade, sub-grade

    D Wearing coarse, base coarse, sub base coarse, sub-grade

62. A rigid pavement of RCC does not have..

    A Base course   B Soil sub-grade

| C | Surface course | D | Sub base course |

63. What is the safe stopping sight distance for a design speed of 60kmph two way traffic on a two lane road assuming co-efficient of friction as 0.36 and reaction time 2 second?

| A | 27.7 m | B | 60.8 m |
| C | 72.7 m | D | 100.8 m |

64. Hydraulic radius of the canal section shown in the figure below is..

| A | 2.16 m | B | 0.80 m |
| C | 2.50 m | D | 1.16 m |

65. The relationship that must hold for the flow to be irrotational is

A
$$\frac{\partial u}{\partial y} - \frac{\partial v}{\partial x} = 0$$

B
$$\frac{\partial u}{\partial x} - \frac{\partial v}{\partial y} = 0$$

C
$$\frac{\partial^2 u}{\partial^2 x} + \frac{\partial^2 v}{\partial^2 y} = 0$$

D
$$\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$$

66. A stream function is given by $\Psi = 2x^2 y + (x + 1)y^2$
The flow rate across a line joining points A(3,0) and B(0,2) is

| A | 0.4 unit | B | 4.0 unit |
| C | 4.4 unit | D | 44.0 unit |

67. If a run-off from a drainage basin of area 4320 km^2 is estimated as 15000 cumec-days, then depth of runoff will be..

| A | 30 cm | B | 3 cm |
| C | 20 cm | D | 200 cm |

68. The 'useful storage' in a dam reservoir is the volume of water stored between.

| A | Normal and maximum reservoir level | B | Minimum and maximum reservoir level |
| C | Minimum and normal reservoir level | D | None of these |

69. The duty of a crop is 432 hectares/cumec, when base period of the crop is 100 days. Delta for the crop will be..

| A | 432 | B | 200 |
| C | 100 | D | 300 |

70. In an area under irrigation project, G.C.A of a irrigation canal is 50000 hectare out of which 80% is C.C.A.If the intensity of irrigation for rabi season is 60% and for kharif season is 20%, then crop ratio is..

| A | 2 | B | 3 |
| C | 1 | D | 4 |

71. Unit of impulse is

A   N.m   B   Kg.m/S

C   N.S   D $Kg.m/s^2$

72. In quadrantal bearing system, bearing of a line varies from

A   0˚ to 180˚   B   0˚ to 270˚

C   0˚ to 360˚   D   0˚ to 90˚

73. Which of the following plan shape for the dock is not preferred?

A   Diamond   B   Rectangular

C   Circular   D   Inclined quays

74. To express sound levels in decibels, sound pressure levels are usually adopted on a reference scale of

A   50 µPa   B   20 µPa

C   10 µPa   D   100 µPa

75. Pollutant standard Index (PSI) value greater than 300 denotes the air quality as..

A   unhealthful   B   good

C   moderate   D   hazardous

76. Carbon monoxide in air effects..
A   eye   B   hair

C   heart   D   skin

77. Minimum D.O. prescribed for a river stream, to avoid fish kill, is
A   4 ppm   B   2 ppm

C   1 ppm   D   6 ppm

78. Which of the following treatment unit works in anaerobic conditions?
A   Sedimentation tank   B   Activated sludge treatment

C   Sludge digestion tank   D   Trickling filters

79. Two samples of water A and B have pH values of 4.3 and 6.3 respectively. How many times more acidic sample A is than sample B?
A   100   B   2

C   20   D   10

80. A water treatment work treats 5000 m^3 of water per day. It consumes 20 kg chlorine per day, then chlorine dosage would be…
A   0.4 mg/lit   B   4 mg/lit

C   0.04mg/lit   D   40 mg/lit

81. If $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$, then what is the value of B such that $AB = C$?

A $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$ B $\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix}$

C $\begin{bmatrix} 1 & 1 \\ -2 & 4 \end{bmatrix}$ D $\begin{bmatrix} 0 & 4 \\ 1 & 3 \end{bmatrix}$

82. What are the eigenvalues of $A = \begin{bmatrix} 4 & -2 \\ -2 & 1 \end{bmatrix}$?

A   0, 5   B   1, 4

C   2, 3   D   1, 5

83. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$, then what is the value of A^{-1}?

A $\dfrac{1}{19}\begin{bmatrix} -2 & -3 \\ -5 & 2 \end{bmatrix}$ B $\dfrac{1}{29}\begin{bmatrix} -2 & -3 \\ -5 & 2 \end{bmatrix}$

C $\dfrac{1}{19}\begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ D $\dfrac{1}{29}\begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$

84. A is a 3×4 real matrix and $AX = B$ is an inconsistent system of equations. Then highest possible rank of A is

A   1   B   2

C   3   D   4

85. Given the matrix $\begin{bmatrix} -4 & 2 \\ 4 & 3 \end{bmatrix}$, the eigenvector is

A $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$ B $\begin{bmatrix} 4 \\ 3 \end{bmatrix}$

C $\begin{bmatrix} 2 \\ -1 \end{bmatrix}$ D $\begin{bmatrix} -1 \\ 2 \end{bmatrix}$

86. What is the value of $\lim\limits_{x \to \infty} \dfrac{x + \sin x}{x + \cos x}$?

A   0   B   1/2

C   -1/2   D   None of these.

87. If $f(x) = \begin{cases} x^2 + 3x + a & \text{for} & x \le 1 \\ bx + 2 & \text{for} & x > 1 \end{cases}$ is differentiable everywhere, find the values of a and b.

    A   3, 5   B   4, 6

    C   5, 3   D   4, 2

88. What is the value of $\int\limits_{0}^{2\pi} e^x \sin\left(\dfrac{\pi}{4} + \dfrac{x}{2}\right) dx$?

    A   5/4   B $-\dfrac{\sqrt{2}}{5}\left(e^{2\pi} + 1\right)$

    C $e^{2\pi} + 1$ D $-\dfrac{e^{2\pi} + 1}{2\sqrt{2}}$

89. If a vector field is given by $\overline{F} = \sin y \; \hat{i} + x(1 + \cos y) \; \hat{j}$ then evaluate the line integral over a circular path given by $x^2 + y^2 = a^2$, $z = 0$.

    A 2π B $\dfrac{\pi}{2} a$

    C $2\pi^2 a^2$ D πa^2

90. Changing the order of integration in the double integral $I = \int\limits_{0}^{8} \int\limits_{x/4}^{2} f(x, y)\, dy\, dx$ leads to

$I = \int\limits_{r}^{s} \int\limits_{p}^{q} f(x, y)\, dx\, dy$. What is q ?

    A $4y$ B x

    C $16y^2$ D   8

91. Find the solution to $x\dfrac{dy}{dx} = y - x\tan(y/x)$.

    A $\left|\cos(x/y)\right| = |cx|$ B $\left|\sin(y/x)\right| = |c\,y|$

    C $\left|\sin(y/x)\right| = |c/x|$ D $\left|\sec(x/y)\right| = |c/y|$

92. Find the solution to $2\dfrac{d^2 y}{dx^2} - 4\dfrac{dy}{dx} + 8y = 0$.

    A $y = e^x\left(A\sin 3x - B\cos 3x\right)$ B $y = e^x\left(A\cos \sqrt{3}x + B\sin \sqrt{3}x\right)$

    C $y = e^{-x}\left(A\sin \sqrt{3}x + B\cos \sqrt{3}x\right)$ D $y = e^{-x}\left(A\cos \sqrt{3}x - B\sin \sqrt{3}x\right)$

93. The solution of the differential equation $3y\dfrac{dy}{dx} + 2x = 0$ represents a family of

A	ellipses	B	parabola
C	circle	D	hyperbola

94. If $z = xy \ln(xy)$, then

A	$x\dfrac{\partial z}{\partial x} + y\dfrac{\partial z}{\partial y} = 0$	B	$y\dfrac{\partial z}{\partial x} = x\dfrac{\partial z}{\partial y}$
C	$x\dfrac{\partial z}{\partial x} = y\dfrac{\partial z}{\partial y}$	D	$y\dfrac{\partial z}{\partial x} + x\dfrac{\partial z}{\partial y} = 0$

95. Evaluate $\displaystyle\oint_c \frac{\sin(\pi z^2) + \cos(\pi z^2)}{(z-1)(z-2)}\,dz$, where c is the circle $|z| = 3$.

A	πi	B	$(2 + 4\pi)i$
C	$i(\sin \pi + \cos \pi)$	D	$4\pi i$

96. The modulus of the complex number $\left(\dfrac{3+4i}{1-2i}\right)$ is

A	$1/\sqrt{5}$	B	$\sqrt{5}$
C	5	D	$1/5$

97. $z = \dfrac{2-3i}{-5+i}$ can be expressed as

A	$0.5 - 0.5i$	B	$-0.5 + 0.5i$
C	$-0.5 - 0.5i$	D	$0.5 + 0.5i$

98. Three coins are tossed at once. What is the probability of getting exactly 2 tails?

A	1/4	B	1/8
C	5/8	D	3/8

99. A company sells an A.C. which fails at a rate 1 out of 1000. If 500 A.C.s are purchased from this company, what is the probability of two of them failing within first year?

A	0.7582	B	0.1172
C	0.0117	D	0.0758

100 The equation $x^3 - x^2 + 4x - 4 = 0$ is to be solved using the NR method. If $x = 2$ is taken as the initial approximation of the solution then the next approximation using this method will be

A	2/3	B	1
C	4/3	D	3/2