

Seat No. _____

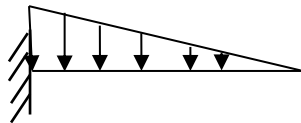
SUB: CIVIL ENGINEERING (CE)

Time: 1 Hour 30 minutes

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

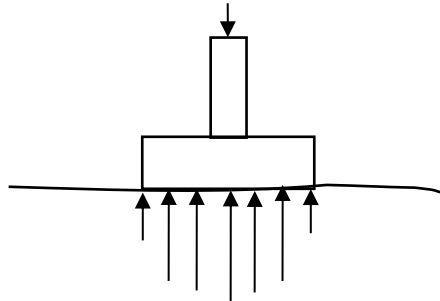
1. What is meaning of TMT bar?
A Tension metal treated bar B Thermo mechanically treated bar
C Thermo mechanically tension bar D None of these
2. A standard concrete cylinder of height 300 mm and 150 mm diameter, when tested under uni-axial compression test, observes 1 mm decrease in height over gauge 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 $(1/48) \delta$ B 48δ
C $(1/16) \delta$ D 16δ

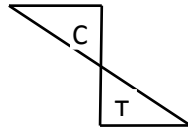
6. Le Chatelier test is conducted to find..
 A Compressive strength of cement B Setting time of cement
 C Specific gravity of cement D Soundness of cement
7. According to sieve analysis, clay particles are having grain size
 A Less than 2 micron B Less than 20 micron
 C Less than 75 micron D Less than 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.....



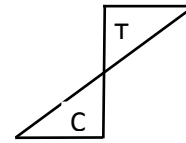
- A Rigid footing resting on saturated clay B Flexible footing on saturated clay
 C Rigid footing resting on cohesion less soil D Flexible footing resting on cohesion less soil
12. As per IS800, maximum value of a effective slenderness ratio for a member carrying compressive loads resulting from dead 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.)

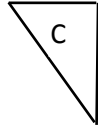
A



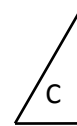
B



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 W_c 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 $\text{kN/m}^2/\text{m}$

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 12 N/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..

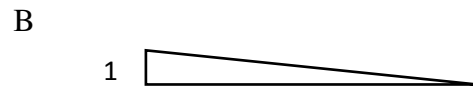
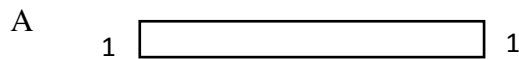
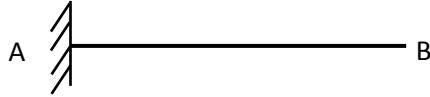
A Along inclined plane

B By crushing

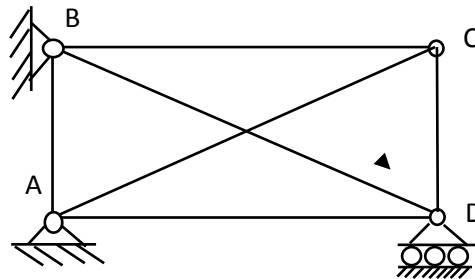
C Along vertical plane

D Along horizontal plane

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



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



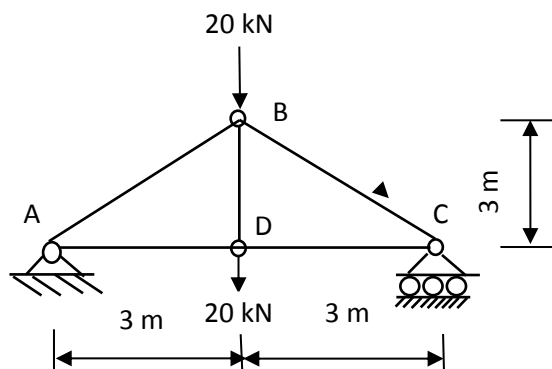
A 1 & 2

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 $\gamma=20 \text{ kN/m}^2$ is..
 A 370 kN/m^2 B 420 kN/m^2
 C 380 kN/m^2 D 430 kN/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 always equal B Porosity η will be always less than void ratio e
 C Porosity η will be always higher than void ratio e D None of these
32. A well graded sand should have
 A $C_u \geq 4.00$ B $C_u \geq 3.00$
 C $C_u \geq 1.00$ D $C_u \geq 6.00$
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 peroxyacetylnitrate D Ozone and peroxyacetylnitrate
35. CBR value of sub-grade soil is 5%. If 4100 kg wheel load and tyre pressure is 6 kg/cm^2 , 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 $\pi R \Delta / 270$ B $\pi R \Delta / 180$
 C $\pi R \Delta / 90$ D $\pi R \Delta / 360$
38. The unit of an area of hydrograph may be..
 A sqmt B metre

- C cumeecs 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 BOD₅ 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 m² B 1000 m²
 C 10000 m² D 100000 m²

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

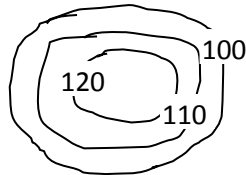
48. Which of the following is leads to systematic error?
 A mistake in reading B bad ranging
 C wrong length of chain D Non of these

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 $420\text{m}^3/\text{s}$. The mean depth of rain fall is 7.0 cm. if average infiltration loss 0.25cm/h and constant base flow of $15\text{m}^3/\text{s}$, then the peak discharge of 4-h unit hydrograph for this catchment is..
- A $58.25\text{m}^3/\text{s}$ B $60.65\text{m}^3/\text{s}$
 C $67.50\text{m}^3/\text{s}$ D $70.5\text{m}^3/\text{s}$
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?

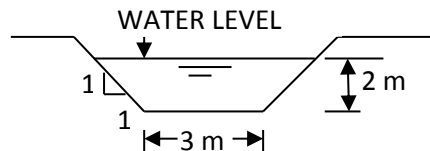
A 27.7 m

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

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

66. A stream function is given by $\Psi = 2x^2y + (x + 1)y^2$
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 km² 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

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 $\frac{1}{19} \begin{bmatrix} -2 & -3 \\ -5 & 2 \end{bmatrix}$

B $\frac{1}{29} \begin{bmatrix} -2 & -3 \\ -5 & 2 \end{bmatrix}$

C $\frac{1}{19} \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$

D $\frac{1}{29} \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$

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 $\lim_{x \rightarrow \infty} \frac{x + \sin x}{x + \cos x}$?

A 0

B 1/2

C -1/2

D None of these.

87. If $f(x) = \begin{cases} x^2 + 3x + a & \text{for } x \leq 1 \\ bx + 2 & \text{for } x > 1 \end{cases}$ 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 $\int_0^{2\pi} e^x \sin\left(\frac{\pi}{4} + \frac{x}{2}\right) dx$?
- A $5/4$ B $-\frac{\sqrt{2}}{5}(e^{2\pi} + 1)$
C $e^{2\pi} + 1$ D $-\frac{e^{2\pi} + 1}{2\sqrt{2}}$
89. If a vector field is given by $\vec{F} = \sin y \hat{i} + x(1 + \cos y) \hat{j}$ then evaluate the line integral over a circular path given by $x^2 + y^2 = a^2, z = 0$.
- A 2π B $\frac{\pi}{2}a$
C $2\pi^2 a^2$ D πa^2
90. Changing the order of integration in the double integral $I = \int_0^8 \int_{x/4}^2 f(x, y) dy dx$ leads to $I = \int_r^s \int_p^q f(x, y) dx dy$. What is q ?
- A $4y$ B x
C $16y^2$ D 8
91. Find the solution to $x \frac{dy}{dx} = y - x \tan(y/x)$.
- A $|\cos(x/y)| = |cx|$ B $|\sin(y/x)| = |cy|$
C $|\sin(y/x)| = |c/x|$ D $|\sec(x/y)| = |c/y|$
92. Find the solution to $2 \frac{d^2 y}{dx^2} - 4 \frac{dy}{dx} + 8y = 0$.
- A $y = e^x (A \sin 3x - B \cos 3x)$ B $y = e^x (A \cos \sqrt{3}x + B \sin \sqrt{3}x)$
C $y = e^{-x} (A \sin \sqrt{3}x + B \cos \sqrt{3}x)$ D $y = e^{-x} (A \cos \sqrt{3}x - B \sin \sqrt{3}x)$
93. The solution of the differential equation $3y \frac{dy}{dx} + 2x = 0$ represents a family of

