

JE/PHE/CE/II/24

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Test Booklet No. :

Series

05809

TEST BOOKLET
Paper—II
(CIVIL ENGINEERING)



Time Allowed : 2 Hours

Full Marks : 100

Read the following instructions carefully before you begin to answer the questions :

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.
2. Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.
3. All questions carry equal marks.

The Answer-Sheet should be submitted to the Invigilator.

Directions for giving the answers : Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.

Example :

Suppose the following question is asked :

The capital of Bangladesh is

- (A) Chennai
(B) London
(C) Dhaka
(D) Dhubri

You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

(A) (B) (C) (D)

In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

(A) (B) (C) (D)

The example shown above is the only correct method of answering.

4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/ Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0.25 per 1 (one) mark against each wrong answer.

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[No. of Questions : 100

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1. For n number of sides, the total sum of interior angles of a closed traverse is

- (A) $(n+2) \times 90^\circ$
- (B) $(2n-4) \times 90^\circ$
- (C) $(2n+4) \times 90^\circ$
- (D) $(4n-2) \times 90^\circ$

2. If the whole circle bearing of a line is $325^\circ 40'$, then quadrantal bearing will be

- (A) $N 34^\circ 20' W$
- (B) $N 55^\circ 40' W$
- (C) $S 55^\circ 40' W$
- (D) None of the above

3. The magnetic bearing of a line is $57^\circ 30'$ and the magnetic declination at that place is $4^\circ 30'$ East. The true bearing will be

- (A) 53°
- (B) 62°
- (C) 60°
- (D) 57°

4. In levelling, backsight is

- (A) a fixed point of known elevation
- (B) the first staff reading taken after setting the instrument
- (C) the last staff reading taken before shifting the instrument
- (D) any staff reading taken on a point of unknown elevation

5. The combined correction for refraction and earth's curvature (in levelling operation) for a distance d in kilometre, is

- (A) $0.07857d^2$ m
- (B) $0.01122d^2$ m
- (C) $0.06735d^2$ m
- (D) $0.057d^2$ m

6. For a curve of radius 100 m and normal chord 10 m, the Rankine's deflection angle is

- (A) $0^\circ 25' 9''$
- (B) $1^\circ 25' 53''$
- (C) $1^\circ 35' 55''$
- (D) $2^\circ 51' 53''$

7. The least count of a vernier scale is

- (A) the sum of the smallest divisions of main and vernier scale
- (B) the value of one division of the primary scale divided by the total number of divisions of vernier scale
- (C) the value of one division of vernier scale divided by the total number of divisions of primary scale
- (D) None of the above

8. $ABCD$ is a rectangular plot of land. If the bearing of one side AB is 75° , the bearing of DC is
- (A) 75°
(B) 255°
(C) 105°
(D) 285°
9. Orientation of a plane table by solving two-point problem is only adopted when
- (A) saving of time is the main factor
(B) better accuracy is the main factor
(C) given points are inaccessible
(D) None of the above
10. Closed contours with higher values inside represents a
- (A) depression
(B) hill
(C) plain surface
(D) None of the above
11. The algebraic sum of the deflection angle of a closed traverse is
- (A) zero
(B) 90°
(C) 180°
(D) 360°
12. A transition curve is introduced to gradually change the
- (A) direction
(B) superelevation
(C) gradient
(D) camber
13. Two hilltops A and B 20 km apart are intervened by a third hilltop C . If the topmost contour of the three hilltops are of the same value, then the line of sight AB
- (A) passes clear of hilltop C
(B) passes below hilltop C
(C) grazes the hilltop C
(D) None of the above
14. The standard size of modular brick is
- (A) $10\text{ cm} \times 10\text{ cm} \times 9\text{ cm}$
(B) $19\text{ cm} \times 9\text{ cm} \times 9\text{ cm}$
(C) $22.5\text{ cm} \times 10\text{ cm} \times 8.5\text{ cm}$
(D) $22.5\text{ cm} \times 8\text{ cm} \times 9\text{ cm}$

15. Slump test of concrete is a measure of its

- (A) consistency
- (B) compressive strength
- (C) tensile strength
- (D) impact value

16. The bearings of two traverse legs AB and BC are $N52^{\circ}45'E$ and $N34^{\circ}30'E$ respectively. The deflection angle is

- (A) $18^{\circ}15'E$
- (B) $18^{\circ}15'N$
- (C) $18^{\circ}15'R$
- (D) $18^{\circ}15'L$

17. A load of 1960 N is raised at the end of a steel wire. The minimum diameter of the wire, so that stress in the wire does not exceed 100 N/mm^2 , is

- (A) 4.0 mm
- (B) 4.5 mm
- (C) 5.0 mm
- (D) 6.0 mm

18. The radius of gyration of a section of area A and least moment of inertia I about the centroidal axis is

- (A) $\frac{A}{I}$
- (B) $\frac{I}{A}$
- (C) $\sqrt{\frac{I}{A}}$
- (D) $\sqrt{\frac{A}{I}}$

19. Bulking of sand is caused due to

- (A) surface moisture
- (B) air voids
- (C) viscosity
- (D) clay contents

20. The foundation in which a concrete beam is provided to join two footings, is known as

- (A) strip footing
- (B) strap footing
- (C) combined footing
- (D) raft footing

21. If 20 kg of coarse aggregate is sieved through 80 mm, 40 mm, 20 mm, 10 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 micron, 300 micron and 150 micron standard sieves and the weights retained are 0 kg, 2 kg, 8 kg, 6 kg, 4 kg respectively, the fineness modulus of the aggregate is
- (A) 7.30
(B) 7.35
(C) 7.40
(D) 7.45
22. Vicat's apparatus is used for cement's
- (A) fineness test
(B) consistency test
(C) compressive strength test
(D) soundness test
23. If B is the width of formation, d is the height of embankment and $s : 1$ is side slope for a highway with no transverse slope, the cross-sectional area is
- (A) $B + d + sd$
(B) $Bd + sd^2$
(C) $\frac{1}{2}(B + sd^2)$
(D) $\frac{1}{2}(Bd + sd^2)$
24. A revised estimate is required to be prepared if the sanctioned estimate exceeds
- (A) 2%
(B) 5%
(C) 8%
(D) 10%
25. The number of bricks of size 19 cm \times 9 cm \times 9 cm required for 10 cubic metres of masonry wall is
- (A) 2000
(B) 4000
(C) 5000
(D) 10000
26. If 10 cm \times 10 cm size of sal wood is to be prepared for a door frame and if the size of the door is 2.1 m \times 1.2 m, then the total length of sal wood required is
- (A) 2.52 m
(B) 5.4 m
(C) 3.3 m
(D) 6.6 m
27. The minimum size of the particles of silt soil is
- (A) 0.002 mm
(B) 0.05 mm
(C) 0.06 mm
(D) 0.08 mm

28. The ratio of weight of water to the weight of solid in a given mass of soil is known as
- (A) void ratio
(B) porosity
(C) specific gravity
(D) water content
29. The rammer used for heavy compaction to determine the optimum moisture content and maximum dry density of a soil by Proctor's test is having mass of
- (A) 2.6 kg
(B) 3.1 kg
(C) 4.5 kg
(D) 4.9 kg
30. The relationship between void ratio (e) and porosity (n) is
- (A) $n = \frac{e}{e-1}$
(B) $e = n(1+e)$
(C) $e = \frac{1+n}{1-e}$
(D) $n = \frac{1+e}{1-e}$
31. A soil sample is having a specific gravity of 2.60 and void ratio 0.78. The water content in percentage required to fully saturate the soil at that void ratio will be
- (A) 10
(B) 30
(C) 50
(D) 70
32. Group symbols assigned to silty sand and clayey sand are respectively
- (A) SS and CS
(B) SM and CS
(C) SM and SC
(D) MS and CS
33. The relation between dry density (γ_d), bulk density (γ) and water content (ω) is
- (A) $\gamma = \frac{\gamma_d}{1+\omega}$
(B) $\gamma_d = \frac{\gamma}{1+\omega}$
(C) $\omega = \frac{\gamma}{1+\gamma_d}$
(D) $\omega = \frac{\gamma}{1-\gamma_d}$
34. The property of soil which permits the flow of water through its interconnected voids is called
- (A) seep ability
(B) porosity
(C) permeability
(D) void ratio

35. The bearing capacity of soil is determined at the site by conducting
- (A) plate load test
 - (B) dynamic penetration test
 - (C) Both (A) and (B)
 - (D) None of the above
36. Foundation failure may occur due to
- (A) unequal settlement of subsoil
 - (B) shrinkage of soil bed
 - (C) lateral escape of soil
 - (D) All of the above
37. In a liquid limit test, the moisture content at 10 blows was 70% and at 100 blows was 20%. The liquid limit of the soil is
- (A) 35%
 - (B) 50%
 - (C) 65%
 - (D) None of the above
38. According to Coulomb's wedge theory, the active earth pressure slides the wedge
- (A) down and outwards on a slip surface
 - (B) up and inwards on a slip surface
 - (C) horizontal upward and parallel to base
 - (D) horizontal inward and parallel to base
39. The direct shear test suffers from which of the following disadvantages?
- (A) Drain condition cannot be controlled
 - (B) Pore water pressure cannot be measured
 - (C) Shear stress on the failure plane is not known
 - (D) The area under the shear and vertical loads does not remain constant throughout the test
40. A rectangular channel 6 m wide and 3 m deep and having a bed slope as 1 in 2000 is running full. If Chezy's constant $C = 54.8$, choose the correct specification of the channel from the following.
- (A) Hydraulic mean depth = 1.5 m
 - (B) Velocity of flow = 1.5 m/sec
 - (C) Rate of flow = $27 \text{ m}^3/\text{sec}$
 - (D) All of the above
41. Hydraulic ram is a device
- (A) for lifting water without an electric motor
 - (B) for accelerating water flow
 - (C) for lifting heavy loads
 - (D) None of the above

42. The total head of a liquid particle in motion is the sum of
- potential head and kinetic head
 - kinetic head and pressure head
 - potential head and pressure head
 - potential head, kinetic head and pressure head
43. The velocity of the fluid particle at the centre of a pipe section is
- minimum
 - maximum
 - equal throughout
 - None of the above
44. As per IS 456 : 2000, the maximum cement content used for RCC construction is
- 350 kg/m³
 - 400 kg/m³
 - 450 kg/m³
 - 500 kg/m³
45. As per IS 456 : 2000, for RCC work, the grade of concrete should not be lower than
- M15
 - M20
 - M25
 - M30
46. Limiting value of moment of resistance for M20 grade of concrete and high strength steel (Fe500) for a section of width b and effective depth d is
- $2.22bd^2$
 - $2.66bd^2$
 - $2.76bd^2$
 - $2.96bd^2$
47. When depths of critical and actual neutral axes are the same in a beam, i.e., when both of them coincide, then the section will be called as
- balanced section
 - under-reinforced section
 - over-reinforced section
 - All of the above
48. Limiting percentage of steel ($p_{t, \text{lim}}$) for M20 grade of concrete and Fe415 steel is
- 1.76
 - 0.96
 - 0.75
 - None of the above
49. A T-beam behaves as a rectangular beam of width equal to its flange, if its neutral axis
- remains within the flange
 - remains below the slab
 - coincides the geometrical centre of the beam
 - None of the above

50. Prestressed concrete means

- (A) compressive stress induced in concrete before bending
- (B) compressive stress induced in steel before bending
- (C) tensile stress induced in steel before bending
- (D) tensile stress induced in concrete before bending

51. A simply supported beam has an effective span of 16 m. As per IS 456 : 2000, the limiting ratio of span to effective depth for control of deflection for the beam shall be

- (A) 26
- (B) 20
- (C) 12.5
- (D) 7

52. The maximum area of tension reinforcement in beams shall not exceed

- (A) $0.04bD$
- (B) $0.02bD$
- (C) $0.08bD$
- (D) $1.10bD$

53. For one-way slab, the ratio of length and breadth of the slab should be

- (A) less than 1.5
- (B) more than 1.5
- (C) less than 2.0
- (D) more than 2.0

54. The maximum strain in concrete in compression at the outermost fibre is

- (A) 0.002
- (B) 0.003
- (C) 0.0035
- (D) 0.0025

55. In a prestressed member, it is advisable to use

- (A) low-strength concrete only
- (B) low-strength steel only
- (C) low-strength steel but high-strength concrete
- (D) high-strength concrete and high-strength steel

56. The distance between centre-to-centre of two adjacent rivet holes should not be less than

- (A) 1.5 times the diameter of rivet hole
- (B) 1.5 times the diameter of rivet
- (C) 1.5 times the diameter of rivet head
- (D) 2.5 times the diameter of rivet

57. The heaviest I-section for same depth is

- (A) ISMB
- (B) ISLB
- (C) ISHB
- (D) ISWB

58. If the diameter of bolt is 20 mm, then the maximum number of bolts that can be accommodated in one row in a 200 mm wide flat is

- (A) 2
- (B) 3
- (C) 4
- (D) 6

59. The partial safety factor for a material of bolts is

- (A) 1.0
- (B) 1.10
- (C) 1.15
- (D) 1.25

60. The effective throat thickness of a fillet weld is K times the size of weld. For a 70° angle between fusion faces, the value of K will be

- (A) 0.7
- (B) 0.65
- (C) 0.6
- (D) 1.0

61. The minimum size of weld for the thickness of thicker member up to 10 mm is

- (A) 3 mm
- (B) 5 mm
- (C) 6 mm
- (D) 8 mm

62. In water-bound macadam roads, binding material is

- (A) sand
- (B) stone dust
- (C) cement
- (D) brick dust

63. On the recommendations of the Indian Roads Congress, the ruling gradient in plains is

- (A) 1 in 15
- (B) 1 in 20
- (C) 1 in 30
- (D) 1 in 10

64. The absolute minimum sight distance required for stopping a vehicle moving with a speed of 80 kmph is

- (A) 120 m
- (B) 200 m
- (C) 640 m
- (D) 800 m

65. California Bearing Ratio method of designing flexible pavements is more accurate because it involves

- (A) characteristic of soils
- (B) traffic intensities
- (C) character of the road making materials
- (D) None of the above

66. On Indian Railways, the standard length of rails for BG track is

- (A) 33 ft (10.6 m)
- (B) 36 ft (10.97 m)
- (C) 39 ft (11.89 m)
- (D) 42.65 ft (13 m)

67. Rails are fixed on steel sleepers

- (A) by bearing plates
- (B) by dog spikes
- (C) by keys in lugs or jaws
- (D) None of the above

68. The convexity provided on the surface of highway is known as

- (A) curve
- (B) camber
- (C) superelevation
- (D) gradient

69. Abrasion test is carried out to find

- (A) hardness of aggregates
- (B) toughness of aggregates
- (C) durability of aggregates
- (D) strength of aggregates

70. The topmost layer of flexible pavements is known as

- (A) base course
- (B) subbase course
- (C) surface course
- (D) subgrade

71. As per IRC, the carriage way width for two-lane traffic road should be
- (A) 7.5 m
 - (B) 10 m
 - (C) 12.5 m
 - (D) 15 m

72. The various treatment processes in a water treatment plant are as follows :

1. Filtration
2. Chlorination
3. Sedimentation
4. Coagulation
5. Flocculation

The correct sequence of these processes in water treatment is

- (A) 1, 2, 3, 4, 5
- (B) 4, 5, 3, 1, 2
- (C) 2, 3, 1, 5, 4
- (D) 1, 2, 5, 3, 4

73. The permissible pH value for public water supply is

- (A) 4.5 to 5.5
- (B) 5.5 to 6.5
- (C) 6.5 to 8.5
- (D) 8.5 to 10.5

74. The standard height of a standard rain gauge is

- (A) 10 cm
- (B) 20 cm
- (C) 30 cm
- (D) 50 cm

75. The rate of accumulation of sludge in septic tanks is recommended as

- (A) 30 litres/person/year
- (B) 25 litres/person/year
- (C) 30 litres/person/month
- (D) 25 litres/person/month

76. If 2% solution of a sewage sample is incubated for 5 days at 20 °C and depletion of oxygen was found to be 5 ppm, BOD of the sewage is

- (A) 200 ppm
- (B) 225 ppm
- (C) 250 ppm
- (D) None of the above

77. Self-cleansing velocity is

- (A) velocity at dry weather flow
- (B) velocity of water at flushing
- (C) velocity at which no accumulation remains in the drains
- (D) velocity of water in pressure filter

78. The most dangerous pollutant in vehicular emissions is

- (A) CO
- (B) SO₂
- (C) CO₂
- (D) O₃

79. The liquid waste from kitchens, bathrooms and wash basins is not known as

- (A) liquid waste
- (B) sullage
- (C) sewage
- (D) None of the above

80. The amount of oxygen consumed by the aerobic bacteria, which causes the aerobic biological decomposition of sewage, is known as

- (A) Biochemical Oxygen Demand (BOD)
- (B) Dissolved Oxygen (DO)
- (C) Chemical Oxygen Demand (COD)
- (D) None of the above

81. In slow sand filters, the turbidity of raw water can be removed only up to

- (A) 60 mg/litre
- (B) 75 mg/litre
- (C) 100 mg/litre
- (D) 150 mg/litre

82. A septic tank is

- (A) an aerobic method of on-site sewage treatment
- (B) an anaerobic method of on-site treatment
- (C) a physical method of water treatment
- (D) a physiochemical method of water treatment

83. The father of principles of management is

- (A) Mary Parkett
- (B) Lillian Gilbert
- (C) Henry Fayol
- (D) Elton Mayo

84. Tender is the

- (A) estimation of cost
- (B) estimation of profit
- (C) estimation of selling price
- (D) estimation of units

85. Labour turnover is
- (A) productivity of labour
 - (B) efficiency of labour
 - (C) change in labour force
 - (D) total cost of labour
86. The minimum number of members in a private company is
- (A) 2
 - (B) 5
 - (C) 7
 - (D) 10
87. The seismic map of India given in IS : 1893-2016 divides the country into how many number of zones?
- (A) 2
 - (B) 3
 - (C) 4
 - (D) 5
88. Earthquake-resistant building should have
- (A) strong columns-strong beams
 - (B) weak columns-weak beams
 - (C) strong columns-weak beams
 - (D) weak columns-strong beams
89. The minimum thickness of shear walls as per IS : 13920 is
- (A) 180 mm
 - (B) 400 mm
 - (C) 200 mm
 - (D) 150 mm
90. Grouting is used for
- (A) strengthening beams
 - (B) strengthening columns
 - (C) repairing cracks
 - (D) strengthening floors
91. Critical Path Method (CPM) network is
- (A) event oriented
 - (B) activity oriented
 - (C) slack oriented
 - (D) float oriented
92. A dummy activity
- (A) has no tail event but only a head event
 - (B) has only a head event but no tail event
 - (C) does not require any resources nor any time
 - (D) has no sequence and can be fitted anywhere

93. The most suitable equipment for compaction of cohesive soils is
- (A) smooth-wheeled roller
 - (B) vibratory roller
 - (C) sheep-footed roller
 - (D) tamper
94. As per IS : 456-2000, the minimum percentage of longitudinal steel in a column is
- (A) 0.5%
 - (B) 0.7%
 - (C) 0.8%
 - (D) 1.0%
95. Short column fails by
- (A) buckling
 - (B) bending
 - (C) crushing
 - (D) None of the above
96. Due to attack of dry rot, the timber
- (A) cracks
 - (B) shrinks
 - (C) reduces to powder
 - (D) None of the above
97. Addition of Pozzolana to ordinary Portland cement causes
- (A) decrease in early strength
 - (B) reduction in chemical action with sulphates
 - (C) increase in shrinkage
 - (D) All of the above
98. Back bearing of a line is equal to
- (A) fore bearing $\pm 90^\circ$
 - (B) fore bearing $\pm 180^\circ$
 - (C) fore bearing $\pm 360^\circ$
 - (D) fore bearing $\pm 270^\circ$
99. The vertical side member of a shutter frame is known as
- (A) style
 - (B) reveal
 - (C) mullion
 - (D) post
100. Imaginary line passing through the points having equal magnetic declination is termed as
- (A) isogonic line
 - (B) agonic line
 - (C) contour line
 - (D) None of the above

SPACE FOR ROUGH WORK

93. The most suitable equipment for compaction of cohesive soils is

(A) smooth-wheeled roller
 (B) vibratory tamper
 (C) sheep-footed roller
 (D) tamper

94. As per IS : 456-1988, the minimum percentage of longitudinal steel in a column is

(A) 0.5%
 (B) 0.75%
 (C) 0.8%
 (D) 1.0%

98. Back bearing of a line is equal to

(A) fore bearing + 90°
 (B) fore bearing + 180°
 (C) fore bearing + 360°
 (D) fore bearing - 180°

99. The vertical side member of a shutter frame is known as

(A) stile
 (B) level
 (C) mullion
 (D) post

100. Imaginary line passing through the points having equal magnetic declination is known as

(A) magnetic line
 (B) agonic line
 (C) contour line
 (D) None of the above

101. Due to shrink of the soil, the timber

(A) cracks
 (B) shrinks
 (C) reduces to powder
 (D) None of the above

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