

Name of Post:	Urban Technical Officer (Junior Grade-III) as per Assam Urban Engineering Service cadre under Department of Housing and Urban Affairs, Govt. of Assam held on 08/10/2023
Advt. No.	16/2023 dated 09.05.2023
Date of Screening Test	08.10.2023

UTO/DOHUA/I/23

E ASKED TO DO SO

Series



TEST BOOKLET

03537

Paper—I

(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.

/1-A

[No. of Questions : 100]

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1. The volume of cement contained in standard cement bag is
 - (A) 0.020 m^3
 - (B) 0.025 m^3
 - (C) 0.030 m^3
 - (D) 0.035 m^3
2. For a common burnt clay brick of class designation 10, the maximum allowable value of water absorption (by weight) is
 - (A) 12%
 - (B) 15%
 - (C) 20%
 - (D) 22.5%
3. The compound that helps in obtaining early strength of cement concrete is
 - (A) tricalcium silicate
 - (B) dicalcium silicate
 - (C) tricalcium aluminate
 - (D) tetracalcium aluminoferrite
4. The strength of concrete is directly proportional to
 - (A) cement-water ratio
 - (B) water-cement ratio
 - (C) sand-cement ratio
 - (D) water-aggregate ratio
5. In a good brick earth, the amount of silica present should be
 - (A) 20%–30%
 - (B) 30%–40%
 - (C) 40%–50%
 - (D) 50%–60%
6. Plywood has great stiffness and strength
 - (A) across the grains
 - (B) along the grains
 - (C) Both (A) and (B)
 - (D) tangential to the grains
7. The specific surface of Portland Pozzolana Cement should **not** be less than (in m^2/kg)
 - (A) 225
 - (B) 250
 - (C) 275
 - (D) 300
8. Distemper is used to coat
 - (A) external concrete surface
 - (B) interior surfaces not exposed to weather
 - (C) woodwork
 - (D) compound wall
9. The rock which is used for damp-proofing, flooring and roofing is
 - (A) slate
 - (B) sandstone
 - (C) limestone
 - (D) marble
10. Choose the paints for painting metalwork (like grillwork) and woodwork in building construction.
 - (A) Oil paints
 - (B) Synthetic enamel paints
 - (C) Plastic emulsion paints
 - (D) Cement paints

11. A cantilever beam of rectangular section is subjected to a load W at the free end. If the depth of the beam is doubled and the load W is halved, then the deflection at the free end as compared to original deflection will be

- (A) doubled
- (B) halved
- (C) one-fourth
- (D) one-sixteenth

12. If in a rigid-jointed space frame, $(6m + r) < 6j$, then the frame is

- (A) unstable
- (B) stable and statically determinate
- (C) stable and statically indeterminate
- (D) None of the above

13. If one end of a prismatic beam AB with fixed ends is given a transverse displacement δ without any rotation, then the transverse reaction at A or B due to this displacement is

- (A) $\frac{6EI\delta}{L^2}$
- (B) $\frac{6EI\delta}{L^3}$
- (C) $\frac{12EI\delta}{L^2}$
- (D) $\frac{12EI\delta}{L^3}$

where EI = flexural rigidity and L = span of the beam AB .

14. For a symmetrical two-hinged parabolic arch, if one support settles horizontally, then the horizontal thrust at support

- (A) is increased
- (B) becomes zero
- (C) remains unchanged
- (D) is decreased

15. In a simply supported beam carrying uniformly distributed load on the entire span, the slope is maximum at

- (A) mid-span
- (B) supported ends
- (C) $\frac{l}{4}$ from either end
- (D) $\frac{l}{3}$ from either end

where l = span of the beam.

16. The shape of a suspended cable under its own weight is

- (A) parabolic
- (B) circular
- (C) catenary
- (D) elliptical

17. A body falls from rest. The velocity of the body, at the instant it has fallen through a height of h metre, is

- (A) $\sqrt{2gh}$
- (B) $\sqrt{2}gh$
- (C) gh
- (D) $2gh$

18. A material is referred to as perfectly rigid if modulus of elasticity of the material is

- (A) infinitely large
- (B) zero
- (C) unity
- (D) greater than modulus of rigidity

19. Two beams of equal cross-sectional area are subjected to equal bending moment. If one beam has square cross-section and the other has circular cross-section, then

- (A) both beams will be equally strong
- (B) circular section will be stronger
- (C) square section will be stronger
- (D) strength of beams will depend on the Young's modulus of the material

20. A fixed beam AB of span l carries a uniformly distributed load w per unit length for half of the span. The fixed end moments at ends A and B are respectively

- (A) $\left(\frac{192}{11}\right)wl^2$ and $\left(\frac{192}{5}\right)wl^2$
- (B) $\left(\frac{11}{192}\right)wl^2$ and $\left(\frac{5}{192}\right)wl^2$
- (C) $\left(\frac{5}{192}\right)wl^2$ and $\left(\frac{11}{192}\right)wl^2$
- (D) $\left(\frac{192}{5}\right)wl^2$ and $\left(\frac{192}{11}\right)wl^2$

21. A simply supported beam of span L and uniform flexural rigidity EI , carries a central load W and total uniformly distributed load W throughout the span. The maximum deflection is given by

- (A) $\frac{19WL^3}{96EI}$
- (B) $\frac{5WL^3}{384EI}$
- (C) $\frac{5WL^3}{96EI}$
- (D) $\frac{13WL^3}{384EI}$

22. A continuous beam ABC consists of spans AB and BC of lengths 4 m and 6 m respectively. The span AB carries a uniformly distributed load of 6 kN/m while the span BC carries a uniformly distributed load of 10 kN/m. The ends A and C are simply supported. The support moments are

- (A) $M_{ab} = 0$, $M_{ba} = +31.8$ kN-m
- (B) $M_{ba} = 0$, $M_{ab} = -31.8$ kN-m
- (C) $M_{ab} = 0$, $M_{ba} = -31.8$ kN-m
- (D) $M_{ba} = 0$, $M_{ab} = +31.8$ kN-m

23. A three-hinged arch consists of two quadrant parts AC and CB of radii R_1 and R_2 . The arch carries a concentrated load W on the crown. The horizontal thrust at each support will be

(A) $V_a = W, V_b = \frac{W}{2}$

(B) $V_a = \frac{W}{2}, V_b = \frac{W}{2}$

(C) $V_a = W, V_b = W$

(D) $V_a = \frac{W}{2}, V_b = W$

24. A beam simply supported at both ends of length L carries two equal unlike couples M at two ends. If the flexural rigidity $EI = \text{constant}$, then the central deflection of the beam is given by

(A) $\frac{ML^2}{4EI}$

(B) $\frac{ML^2}{16EI}$

(C) $\frac{ML^2}{64EI}$

(D) $\frac{ML^2}{8EI}$

25. If a frame has ten members and six numbers of joints, then the frame is called

(A) statically determinate

(B) internally indeterminate

(C) externally indeterminate

(D) statically equilibrium

26. In designing RCC column, the minimum eccentricity to be considered is

(A) 10 mm

(B) 12 mm

(C) 15 mm

(D) 20 mm

27. For limit state design of RC beams in flexure, the maximum strain in concrete at the outermost compression fibre is taken as

(A) 0.0020

(B) 0.0025

(C) 0.0032

(D) 0.0035

28. For E250 grade structural steel, the ultimate tensile stress (minimum) is

(A) 415 MPa

(B) 450 MPa

(C) 250 MPa

(D) 410 MPa

29. Consider a rolled steel section having compression flange width = 500 mm and flange thickness = 50 mm. If the web thickness is 12 mm, then the section can be classified as

(A) plastic

(B) compact

(C) semi-compact

(D) slender

30. In a plate girder, web shall be checked for shear buckling when $\frac{d}{t}$ is less than

- (A) 12
- (B) 32
- (C) 40
- (D) 67

where d = depth of web, t = web thickness and $f_y = 250$ MPa.

31. For welding design of structural steel in field condition, the partial safety factor materials, γ_m is taken as

- (A) 1.5
- (B) 1.25
- (C) 1.20
- (D) 1.10

32. In a multistoried RCC building, the imposed uniformly distributed floor loading is 5 kN/m^2 . The imposed loading to be considered in calculation of seismic weight of the building is

- (A) 2.5 kN/m^2
- (B) 3 kN/m^2
- (C) 4 kN/m^2
- (D) 5 kN/m^2

33. An isolated square footing of size $3 \text{ m} \times 3 \text{ m}$ has a uniform depth of the slab = 800 mm . It is reinforced with 20 mm dia rebars, with clear cover of 75 mm . The column size is $400 \text{ mm} \times 400 \text{ mm}$. Calculate the distance of the critical section for one-way shear from the footing edge.

- (A) 715 mm
- (B) 885 mm
- (C) 585 mm
- (D) 620 mm

34. For seismic design of multistoried building in Guwahati, the seismic zone factor to be considered is

- (A) 0.24
- (B) 0.36
- (C) 0.40
- (D) 0.18

35. The plastic neutral axis

- I. divides the given section into two equal halves
- II. divides the given section into two unequal halves
- III. lies on the centroidal axis of the section

Which of the above is true?

- (A) I
- (B) II only
- (C) III only
- (D) II and III

36. Two wheel loads 200 kN and 80 kN spaced 2 m apart move on the span of the girder 16 m long. If any wheel load can lead the other, the maximum bending moment that can occur at a section 6 m from the left-hand end will be
(A) 990 kN-m
(B) 1050 kN-m
(C) 800 kN-m
(D) 750 kN-m
37. In a combined footing for two columns carrying unequal loads, the maximum hogging bending moment occurs at
(A) less loaded column
(B) more loaded column
(C) the point of maximum shear force
(D) the point of zero shear force
38. On piles, the drop must be at least
(A) 80 cm
(B) 100 cm
(C) 120 cm
(D) 140 cm
39. As per IS : 456, the reinforcement in a column should **not** be less than or more than
(A) 0.5% and not more than 5% of cross-sectional area
(B) 0.6% and not more than 6% of cross-sectional area
(C) 0.7% and not more than 7% of cross-sectional area
(D) 0.8% and not more than 8% of cross-sectional area
40. Which type of stiffener is used to prevent local buckling of the web in a plate girder due to concentrated loading?
(A) Torsion stiffener
(B) Bearing stiffener
(C) Load-carrying stiffener
(D) Diagonal stiffener
41. The star and grid pattern of road network was adopted in
(A) Nagpur Road Plan
(B) Lucknow Road Plan
(C) Bombay Road Plan
(D) Delhi Road Plan
42. Aggregate impact value indicates which of the following properties of aggregates?
(A) Durability
(B) Toughness
(C) Hardness
(D) Strength
43. In flexible pavement, the load transfer to lower layers is by
(A) bending action of layers
(B) shear deformation
(C) grain-to-grain contact
(D) consolidation of subgrade

44. For laying bituminous carpet over water-bound macadam road surface, one has to apply a

- (A) tack coat
- (B) seal coat
- (C) bitumen grout
- (D) slurry coat

45. The modulus of subgrade reaction is evaluated from

- (A) plate bearing test
- (B) CBR test
- (C) direct shear test
- (D) triaxial test

46. Which of the following is **not** a failure of rigid pavement?

- (A) Pumping
- (B) Joint stripping
- (C) Scaling
- (D) Rut

47. The stone aggregates to be used in surface course of road, the test values for aggregate impact test, aggregate crushing test and combined value of flakiness and elongation index respectively as per IS : 2386 are

- (A) less than 30%, less than 30%, and 30%
- (B) less than 35%, less than 35%, and 30%
- (C) less than 40%, less than 10%, and 30%
- (D) less than 20%, less than 40%, and 30%

48. In fundamental diagram of traffic flow, which of the following statements is true?

- (A) Traffic flow increases with increase of concentration.
- (B) Traffic flow decreases with increase of concentration.
- (C) Traffic flow decreases up to the half of maximum concentration.
- (D) Traffic flow increases up to the half of maximum concentration.

49. A road sign indicating 'No Parking' is

- (A) warning sign
- (B) mandatory sign
- (C) stop sign
- (D) informative sign

50. The design of intersection system is important as it governs

- (A) efficiency of traffic operation, safety, speed of vehicle and volume of traffic
- (B) efficiency of traffic operation, safety, cost of operation, speed and traffic volume
- (C) efficiency of operation, safety, speed and capacity
- (D) efficiency of operation, cost of operation, safety, speed and density

51. A series of closely spaced contour lines represents a

- (A) steep slope
- (B) uniform slope
- (C) horizontal slope
- (D) gentle slope

52. The process of turning the telescope about a vertical axis in a horizontal plane is called
- reversing
 - transiting
 - plunging
 - swinging
53. To determine the length of a bridge proposed to be built across a river, the survey method of choice would be
- tacheometry
 - chain survey
 - hydrographic survey
 - triangulation
54. The sum of measured interior angles for a closed traverse shall be equal to
- $(N - 4) \times 90^\circ$
 - $(2N - 4) \times 90^\circ$
 - $(2N - 3) \times 90^\circ$
 - $(2N + 3) \times 90^\circ$
55. The correction to be applied for a 30 m long chain along slope (α) is
- $30(1 - \cos \alpha)$
 - $30 \cos \alpha$
 - $30(\cos \alpha - 1)$
 - $30(\sec \alpha - 1)$
56. For a well-conditioned triangle, no angle should be less than
- 20°
 - 30°
 - 45°
 - 60°
57. If the quadrantal bearing of a line is $N 25^\circ W$, then the whole-circle bearing of the line is
- 25°
 - 205°
 - 335°
 - 295°
58. Which of the following errors can be eliminated by taking mean of both face observations?
- Error due to imperfect graduations
 - Error due to eccentricity of verniers
 - Error due to imperfect adjustment of plate levels
 - Error due to line of collimation not being perpendicular to horizontal axis
59. Overturning of vehicles on a curve can be avoided by using
- compound curve
 - vertical curve
 - reverse curve
 - transition curve

60. It is required to produce a small scale map of an area in a magnetic zone by directly plotting and checking the work in the field itself. Which one of the following surveys will be most appropriate for this purpose?
- Chain survey
 - Theodolite survey
 - Plane table survey
 - Compass survey
61. Two-peg test is conducted to check which of the following permanent adjustments of dumpy level?
- Axis of bubble tube is perpendicular to vertical axis
 - Horizontal cross-hair lies in a plane perpendicular to the vertical axis
 - The line of sight is truly parallel to the axis of the bubble tube
 - All of the above
62. To apply Simpson's rule for computation of irregular area, the number of segments
- should be of equal width and odd number
 - should be of equal width and even number
 - may be of varying width also
 - may be even or odd
63. In a reverse curve, the super-elevation provided at the point of reverse curvature
- is minimum
 - is zero
 - is maximum
 - depends upon the elements of curve
64. If the volume of voids is equal to the volume of solids in a soil mass, then the values of porosity and void ratio respectively are
- 1 and 0
 - 0 and 1
 - 0.5 and 1
 - 1 and 0.5
65. According to Atterberg, the soil is said to be of medium plasticity if the plasticity index (PI) is
- $0 < PI < 7$
 - $7 \leq PI \leq 17$
 - $17 < PI < 27$
 - $PI \geq 27$
66. A plate load test was conducted on a soaked subgrade during monsoon season using a plate of diameter 30 cm. If the modulus of subgrade reaction for 30 cm dia plate is 16.86 kg/cm^3 , then the modulus of subgrade reaction for standard plate of diameter 70 cm is
- 5.75 kg/cm^3
 - 5.57 kg/cm^3
 - 6.57 kg/cm^3
 - 6.75 kg/cm^3
67. For better strength and stability, the fine-grained soil and coarse-grained soil are compacted respectively as
- dry of OMC and wet of OMC
 - wet of OMC and dry of OMC
 - wet of OMC and wet of OMC
 - dry of OMC and dry of OMC

68. For a loose sand sample and a dense sand sample consolidated to the same effective stress, the
- ultimate strength is same and also peak strength is same
 - ultimate strength is same but peak strength of dense sand is greater than that of loose sand
 - ultimate strength is different but peak strength is same
 - ultimate strength is same but peak strength of loose sand is greater than that of dense sand
69. A saturated clay layer with single drainage face takes 4 years to attain 50% degree of consolidation. If the clay layer had double drainage, then the time required to attain 50% degree of consolidation would be
- 8 years
 - 4 years
 - 2 years
 - 1 year
70. A soil sample has void ratio of 0.50. Its porosity will be close to
- 50%
 - 66%
 - 100%
 - 33%
71. The efficiency of a pile group
- will be always less than 100%
 - will be always more than 100%
 - may be less than 100% or more than 100%
 - will be more than 100% in cohesive soil and less than 100% in cohesionless soil
72. Two footings, one circular and the other square, are founded on the surface of a purely cohesionless soil. The diameter of the circular footing is same as the side of the square footing. The ratio of their ultimate bearing capacities (circular to square) is
- $\frac{3}{4}$
 - $\frac{4}{3}$
 - 1.0
 - 1.3
73. Which of the following corrections is required while using standard penetration test values?
- Overburden pressure
 - Dilatancy
 - Groundwater
 - All of the above
74. The behaviour of a sand mass to cause liquefaction during an earthquake depends largely on
- the number of stress cycles
 - the frequency and amplitude of earthquake shock
 - the angle of internal friction of sand
 - the relative density of sand
75. A soil sample of specific gravity 2.65 has a void ratio of 0.8. The water content in percentage required to saturate the soil is
- 40
 - 30
 - 20
 - 10

76. Temporary hardness of water is caused by the presence of
- bicarbonates of Ca and Mg
 - sulphates of Ca and Mg
 - chlorides of Ca and Mg
 - nitrates of Ca and Mg
77. Among the following disinfectants of wastewater, the one that is most commonly used is
- chlorine dioxide
 - chloride
 - ozone
 - UV-radiation
78. Two primary air pollutants are
- sulphur oxide and ozone
 - nitrogen oxide and ozone
 - sulphur oxide and hydrocarbon
 - ozone and hydrocarbon
79. pH value for drinking water as per IS 10500 : 2012 is
- 6.0-7-8.6
 - 5.5-7-8.5
 - 6.5-7-8.0
 - 6.5-7-8.5
80. Low TDS value is not good for health, so before drinking water (H_2O), TDS is measured using conductivity. The acceptable value is
- 274 mg/L
 - 502 mg/L
 - 512 mg/L
 - 560 mg/L
81. Which of the following air pollutants is responsible for making hole in O_3 layer?
- SO_2
 - NO_2
 - CO
 - CO_2
82. Coal-based thermal power plant pollutes the atmosphere by adding
- NO_2 and SO_2
 - NO_2 , SO_2 and SPM
 - NO_2 , SO_2 , SPM and CO
 - NO_2 , SPM and CO
83. BOD is preferred to COD as an index of sewage concentration because
- BOD represents both carbonaceous and nitrogenous organic matters while COD may indicate carbonaceous matter only
 - BOD test is easier to perform and gives more reliable results
 - BOD relates specifically to putrescible organic matter which is the most objectionable sewage constituent
 - COD relates to impurities which can only be removed by chemical treatment which is expensive
84. Trickling filters are used to remove
- suspended solids
 - colloidal solids
 - organic matters
 - pathogenic bacteria

85. The unit in which both sedimentation and digestion processes of sludge take place simultaneously is
- skimming tank
 - Imhoff tank
 - detritus tank
 - digestion tank
86. Inner dimensions of a room are $6\text{ m} \times 4\text{ m}$ with 0.40 m wall thickness. The center line length shall be
- 20.0 m
 - 20.8 m
 - 21.6 m
 - 23.2 m
87. The damp-proof course (DPC) in a building is measured in
- square metre
 - metre
 - cubic metre
 - None of the above
88. Due to change in price level, a revised estimate is prepared if the sanctioned estimate exceeds by
- 2%
 - 4%
 - 5%
 - 10%
89. The analysis of rate is usually worked out for the unit of payment of the particular item of work under which of the following heads?
- Materials
 - Labour
 - Both (A) and (B)
 - None of the above
90. The calculated quantity of metal (loose) for a 3.70 m wide macadam road for one km length for one layer 8 cm compacted thickness is
- 440 cu m
 - 400 cu m
 - 390 cu m
 - 444 cu m
91. Depending upon the nature of the road, width and thickness of metalling, etc., for a 20 km of State Highway approximate cost @ ₹ $5,00,000$ per kilometre works out as
- 50 lakhs
 - 55 lakhs
 - 100 lakhs
 - 99 lakhs
92. In a bar chart, which color is used to show the actual progress?
- Red
 - Black
 - Blue
 - Green

93. The difference between the maximum time available and the actual time needed to perform an activity is known as

- (A) free float
- (B) independent float
- (C) total float
- (D) half float

94. Various activities of a project are shown on a bar chart by

- (A) vertical lines
- (B) horizontal lines
- (C) dots
- (D) curves

95. PERT analysis is based on

- (A) optimistic time
- (B) pessimistic time
- (C) most likely time
- (D) All of the above

96. The problem of determining rental value of a property is to be tackled from which of the following?

- (A) When the property is rented
- (B) When the property is not rented
- (C) When both (A) and (B) are considered
- (D) None of the above

97. The process of incorporating changes and rescheduling or replanning is called

- (A) resource levelling
- (B) resource smoothening
- (C) updating
- (D) critical path scheduling

98. Expected project duration generally follows

- (A) normal distribution curve
- (B) Poisson's distribution curve
- (C) β -distribution curve
- (D) None of the above

99. The most suitable type of equipment for compaction of cohesive soil is

- (A) smooth wheel roller
- (B) vibratory roller
- (C) sheepfoot roller
- (D) tamper

100. In time-cost optimization, using CPM method for network analysis, the crashing of the activities along the critical path is done starting with the activity having

- (A) longest duration
- (B) highest cost slope
- (C) least cost slope
- (D) shortest duration