CVLENG/CSR/03/26

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

Test Booklet No. : 00533

Series A

TEST BOOKLET

CIVIL ENGINEERING

Time Allowed : 2 Hours **Full Marks : 200**

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 :

   Ⓐ Ⓑ Ⓒ Ⓓ

   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 :

   Ⓐ Ⓑ ● Ⓓ

   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.

SEAL

[No. of Questions : 100]

1. Which is not a benefit of Portland Pozzolana Cement?

(A) It is environment-friendly

(B) It produces low heat of hydration

(C) It is resistant to aggressive water

(D) It has higher strength than Ordinary Portland Cement

2. For a concrete gravity dam to be built in North-East India, which of the following cement grades will be most suitable?

(A) PPC

(B) OPC 33

(C) OPC 43

(D) OPC 55

3. The recent Indian Standards on aggregates allow

(A) iron slag

(B) recycled concrete aggregates

(C) recycled aggregates

(D) All of the above

4. Tolerances in bricks are with reference to

(A) compressive strength

(B) water absorption

(C) dimension

(D) efflorescence

5. Arris in a paver block can be

(A) bevelled

(B) rounded

(C) chamfered

(D) All of the above

6. Aluminium composite panels have the second material _____ apart from aluminium.

(A) steel

(B) zinc

(C) copper

(D) low-density polyethylene

7. Which type of cement is not recommended by IRC 76 for road construction?

(A) Ordinary Portland Cement 43 grade

(B) Ordinary Portland Cement 53 grade

(C) Portland Pozzolana Cement

(D) None of the above

8. Which of the following statements is true?

(A) Lesser cement content means less water and hence less chances of shrinkage crack.

(B) Lesser cement content means more water and hence less chances of shrinkage crack.

(C) Lesser cement content means less water and hence more chances of shrinkage crack.

(D) Water content has no influence on shrinkage crack.

9. Aggregates for pavement concrete have a Los Angeles (LA) Abrasion/ Aggregate Impact Value (AIV)

(A) not more than 35%

(B) not more than 45%

(C) not more than 50%

(D) not more than 25%

10. The combined flakiness and elongation index of aggregates for pavement concrete shall not be more than

(A) 35%

(B) 45%

(C) 55%

(D) 60%

11. The correction for the atmospheric refraction is equal to

(A) $+\frac{1}{7}$ of the correction for curvature of the earth

(B) $-\frac{1}{7}$ of the correction for curvature of the earth

(C) $+\frac{6}{7}$ of the correction for curvature of the earth

(D) $-\frac{6}{7}$ of the correction for curvature of the earth

12. Quadrantal bearing is always measured from

(A) the north end of the magnetic meridian only

(B) the south end of the magnetic meridian only

(C) the north end or the south end of the magnetic meridian only

(D) either the north end or the south end of the magnetic meridian as the case may be

13. The long chord of a circular curve of radius R with deflection angle Δ is given by

(A) $2R\cos\left(\frac{\Delta}{2}\right)$

(B) $2R\sin\left(\frac{\Delta}{2}\right)$

(C) $2R\tan\left(\frac{\Delta}{2}\right)$

(D) $2R\sec\left(\frac{\Delta}{2}\right)$

14. If the areas calculated by end-area rule and prismoidal rule are A_e and A_p respectively, then $(A_e - A_p)$

(A) is always positive

(B) is always negative

(C) may be positive or negative

(D) is equal to zero

15. The temperature correction and pull correction

(A) may have the same sign

(B) always have the same sign

(C) always have opposite signs

(D) always have positive sign

16. Perpendicularity of an offset may be judged by eye if the length of the offset is less than

(A) 5 m

(B) 10 m

(C) 15 m

(D) 20 m

17. Non-horizontality in chain surveying

(A) is compensating in nature

(B) is cumulative in nature

(C) can be (A) or (B)

(D) None of the above

18. In triangulation survey, calculation of length of base by tape involves the correction of sag which

(A) is always negative

(B) is always positive

(C) can be (A) or (B)

(D) None of the above

19. Electromagnetic Distance Measurement (EDM) can be done by

(A) Geodimeter

(B) Tellurometer

(C) Distomat

(D) All of the above

20. In a whole circle bearing system, S 25° 15′ E corresponds to

(A) 115° 15′

(B) 154° 45′

(C) 205° 15′

(D) 334° 45′

21. In shallow foundation, the load transference is primarily through

(A) shear resistance of bearing strata

(B) frictional resistance of soil above bearing strata

(C) torsional resistance of bearing strata

(D) bending resistance of bearing strata

22. The depth of shallow foundation is generally up to

(A) 1 m

(B) 1·5 m

(C) 2 m

(D) 3 m

23. Which is not a shallow foundation?

(A) Ring and shell foundation

(B) Raft foundation

(C) Strip footing

(D) None of the above

24. Which is not a type of pile foundation?

(A) Under-reamed pile

(B) Cast-in-situ pile

(C) Timber pile

(D) None of the above

25. All types of foundation must have a minimum depth beyond natural ground level of

(A) 40 cm

(B) 50 cm

(C) 60 cm

(D) 1 m

26. As per IS1904(1986), the factor of safety for a shallow foundation against overturning, when dead load, live load and earth pressures are considered together with wind load or seismic load, shall not be less than

(A) 1·5

(B) 2·0

(C) 2·5

(D) 3·0

27. Which is not an application of flow net?

(A) Determination of seepage

(B) Determination of hydrostatic pressure

(C) Determination of seepage pressure

(D) None of the above

28. The negative skin friction on a pile develops when

(A) the soil in which it is driven is sandy soil

(B) the soil surrounding it settles more than the pile

(C) the groundwater table rises

(D) the soil near the top of the ground is clay

29. The angle of the failure plane with the major principal plane is given by

(A) $45° + \phi'$

(B) $45° + \frac{\phi'}{2}$

(C) $45° - \frac{\phi'}{2}$

(D) $45° - \phi'$

where ϕ' is the angle of shearing resistance.

30. The ratio of the total volume of voids to the total volume of soil mass is called

(A) water-cement ratio

(B) porosity

(C) void ratio

(D) degree of saturation

31. A ductile material is one which

(A) can stretch beyond yield point without great increase in stress

(B) cannot stretch beyond yield point

(C) can stretch beyond yield point with great increase in stress

(D) can stretch beyond limit of proportionality without great increase in stress

32. The limiting percentage of samples which can fail the characteristic strength of material is

(A) 5%

(B) 10%

(C) 0%

(D) 2%

33. Which statement about metakaolin is false?

(A) Metakaolin having fineness between $700\ m^2/kg$ and $900\ m^2/kg$ may be used as Pozzolanic material in concrete.

(B) It is obtained by calcination of pure kaolinite clay.

(C) It is obtained by calcination of refined kaolinite clay.

(D) Metakaolin has low Pozzolanicity.

34. Which material should not be used as aggregates for reinforced cement concrete members?

(A) Slag

(B) Crushed overburnt brick

(C) Crushed overburnt tile

(D) All of the above

35. Which material may be used as aggregates for concrete member?

(A) Heavy-weight aggregates

(B) Light-weight aggregates such as bloated clay aggregates and sintered fly ash aggregates

(C) None of the above

(D) Both (A) and (B)

36. The nominal size of the aggregates should not be greater than

(A) $\frac{1}{4}$ of the minimum thickness of the member

(B) $\frac{1}{3}$ of the minimum thickness of the member

(C) $\frac{1}{5}$ of the minimum thickness of the member

(D) None of the above

37. Coating of reinforcement is allowed in reinforced concrete structure under

(A) exceptional cases

(B) rehabilitation of structures

(C) Both (A) and (B)

(D) None of (A) and (B)

38. Which of the following statements is false?

(A) Seawater may be used for curing plain concrete under extraordinary circumstances.

(B) Seawater may be used for curing reinforced concrete under extraordinary circumstances.

(C) Mixing or curing of concrete with seawater is not recommended.

(D) None of the above

39. The tensile strength of concrete is given by

(A) flexural tensile strength

(B) splitting tensile strength

(C) $f_{cr} = 0 \cdot 7\sqrt{f_{ck}}$

(D) All of the above

40. The type of elastic modulus of concrete given in the expression $E_c = 5000\sqrt{f_{ck}}$ is

(A) short-term dynamic

(B) long-term static

(C) short-term static

(D) long-term dynamic

41. The total shrinkage in concrete depends upon

(A) constituents of concrete

(B) size of member

(C) environmental condition

(D) All of the above

42. The degree of workability of mass concreting is

(A) very low

(B) low

(C) medium

(D) high

43. Which of the following is a factor affecting durability of concrete?

(A) The environment

(B) The cover to embedded steel

(C) The type and quality of constituent material

(D) All of the above

44. The free water-cement ratio for good durability should always be

(A) lowest

(B) highest

(C) medium

(D) No relation with durability

45. Which is a potential source of chloride attack in concrete?

(A) Cement

(B) Aggregates

(C) Water and admixture

(D) All of the above

46. The minimum cement content in concrete is

(A) dependent on nominal maximum aggregate size

(B) independent of nominal maximum aggregate size

(C) dependent on nominal minimum aggregate size

(D) None of the above

47. The average grading of fine aggregate is

(A) zone I

(B) zone II

(C) zone III

(D) None of the above

48. In normal circumstance, the minimum period of striking off formwork for concrete construction of column wall and beam is

(A) 16–24 hours

(B) 3 days

(C) 7 days

(D) 21 days

49. Curing of concrete is a process of

(A) preventing loss of moisture from concrete

(B) providing additional water for progressive setting

(C) Both (A) and (B)

(D) None of the above

50. For concrete containing Portland Pozzolana Cement, Portland Slag Cement or Mineral Admixture, the curing period may be

(A) increased

(B) decreased

(C) unaffected

(D) None of the above

51. The minimum cover for reinforced footing should be

(A) equal to the diameter of the reinforcing bar

(B) 30 mm

(C) 50 mm

(D) None of the above

52. The cross-sectional area for longitudinal reinforcement in a column

(A) should not exceed 6% of gross cross-sectional area of the column

(B) should not be less than 0·8% of gross cross-sectional area of the column

(C) Both (A) and (B)

(D) None of the above

53. In limit state design, the partial safety factor for steel is

(A) higher than that for concrete

(B) lower than that for concrete

(C) equal to that for concrete

(D) 1·5

54. The cleaning of rapid sand filters is typically done by

(A) scrapping thin layer of sand

(B) reversing water flow and air scouring

(C) washing only the surface

(D) replacing the whole sand bed

55. Superchlorination is primarily used for

(A) pre-treatment of raw water before filtration

(B) application of excess chlorine to eliminate taste and odour at high concentration

(C) maintaining chlorine residuals throughout the supply

(D) reducing chlorine demand before filtration

56. What distinguishes a partially separate sewage system?

(A) It is identical to the combined system

(B) It has only one type of water flowing

(C) It includes a separate sewer for domestic sewage and industrial waste, but also drains a portion of surface water

(D) It discharges everything into rivers

57. What are the three types of settling in the sedimentation of sewage?

(A) Plain, rapid, slow

(B) Flocculent, hindered, compression

(C) Chemical, biological, mechanical

(D) Surface, sub-surface, deep

58. What is the main function of trickling filter?

(A) To remove suspended solid by sedimentation

(B) To oxidize organic materials biologically in wastewater

(C) To disinfect water using chemicals

(D) To filter out large debris using sand

59. Specific capacity of a well is the

(A) volume of water that can be extracted by the force of gravity from a unit volume of aquifer

(B) discharge per unit drawdown of the well

(C) drawdown per unit discharge of the well

(D) rate of flow through a unit width and entire thickness of aquifer

60. The performance of a well is measured by its

(A) specific capacity

(B) specific yield

(C) storage coefficient

(D) permeability coefficient

61. Double mass curves are used

(A) to check on the consistency of population record

(B) as basis for storm rainfall analysis

(C) to determine average rainfall over an area

(D) to indicate rainfall distribution

62. The contour lateral method of irrigation is particularly suitable for

(A) level fields without any prominent grade

(B) steeper terrain with significant changes in slope

(C) fields where full flooding is desired in one go

(D) the use of mechanical harvesting machinery

63. Which irrigation system generally has the highest duty?

(A) Inundation irrigation system

(B) Furrow irrigation system

(C) Perennial irrigation system

(D) Flood irrigation system

64. What is the typical thickness of the microbial film on filter media in trickling filter?

(A) 0·01–0·02 mm

(B) 0·1–0·2 mm

(C) 1–2 mm

(D) 5–10 mm

65. What does 'prime cost' refer to in construction estimate?

(A) The total contract cost including labour

(B) The actual cost of articles at shop, not including labour or installation

(C) The estimated profit for the contractor

(D) The fixed overhead cost for the project

66. 'Bill of quantities' is best described as

(A) a sanction of administrative approval

(B) a statement of items of work with quantities and rate

(C) the expenditure sanction rate

(D) a report on project completion

67. Which method is typically adopted for accumulating a sinking fund?

(A) Lump-sum payment

(B) Periodic or annual deposits

(C) One-time donation

(D) Property sale

68. In buildings with cross or partition wall, what needs to be deducted for each junction in the centreline method?

(A) Full breadth of the respective item

(B) No deduction

(C) Half breadth of the respective item

(D) Double the breadth of the respective item

69. Who is/are credited with introducing the Critical Path Method (CPM)?

(A) James E. Kelley and Morgan R. Walker

(B) Admiral W. F. Raborn

(C) Henry Gantt

(D) Frederick Taylor

70. Which is not a limitation of bar charts?

(A) Interdependencies of activities

(B) Project progress

(C) Uncertainties

(D) None of the above

71. Critical path has the

(A) longest path time-wise

(B) shortest path time-wise

(C) events in the path which can be delayed

(D) None of the above

72. What is the primary objective of resource scheduling in project management?

(A) Minimizing resource quality

(B) Achieving a time-cost balance relationship

(C) Reducing the number of managers

(D) Maximizing equipment idle time

73. CPM requires

(A) single time estimate

(B) double time estimate

(C) triple time estimate

(D) None of the above

74. A dummy activity in a network

(A) is represented by a dotted line

(B) is an artificial activity

(C) does not consume time or resources

(D) All of the above

75. An activity requires

(A) events

(B) resources

(C) time and resources

(D) energy

76. Consumptive use includes

(A) evaporation

(B) transpiration

(C) Both (A) and (B)

(D) None of the above

77. Recently completed Subansiri river dam is a/an

(A) concrete gravity dam

(B) earthen dam

(C) arch dam

(D) None of the above

78. The type of groyne to be used upstream of Majuli to save it from erosion is

(A) attracting

(B) repelling

(C) neutral

(D) None of the above

79. Treatment of sewage with bacteria is also known as

(A) primary treatment

(B) secondary treatment

(C) tertiary treatment

(D) None of the above

80. Activated sludge is

(A) active carbon

(B) zoogleal matrix of protozoa and other living organisms

(C) Both (A) and (B)

(D) None of the above

81. In India, as per the Indian Standards, the water consumption per capita per day for domestic purpose is

(A) 85 litres

(B) 100 litres

(C) 115 litres

(D) 135 litres

82. The Freeman formula for estimating the fire demand (Q) in litres per minute is given by

(A) $Q = 3182\sqrt{P}$

(B) $Q = 5663\sqrt{P}$

(C) $Q = 1135\left(\frac{P}{5} + 10\right)$

(D) $Q = 2500\left(\frac{P}{5} + 10\right)$

where P = population in thousands.

83. High turbidity of water can be determined by

(A) turbidity tube

(B) Jackson turbidimeter

(C) Baylis turbidimeter

(D) Hellige turbidimeter

84. The minimum dissolved oxygen required in water to save the aquatic life is

(A) 1 ppm

(B) 2 ppm

(C) 4 ppm

(D) 8 ppm

85. The layers such as limestone and sandstone which do not allow the water to pass through them are called

(A) aquifers

(B) aquicludes

(C) aquifuges

(D) None of the above

86. At what condition do the alternate depths (y_1, y_2) merge into a single value?

(A) When discharge is maximum

(B) When specific energy equals the maximum possible value

(C) When the channel slope is vertical

(D) When the channel bed is rough

87. Which of the following best describes a rigid boundary channel?

(A) The boundary undergoes substantial deformation and changes shape due to flow erosion

(B) The boundary is not deformable and its geometry is essentially constant over time

(C) The bed constantly changes due to sediment transport

(D) The channel banks more laterally with the flow

88. In an unsteady open channel flow, the continuity equation states that

(A) discharge at every section is always same

(B) the net discharge going in or out equals the rate of depletion or storage within the reach

(C) only storage changes, not discharge

(D) open channel velocity is always constant

89. For a triangular channel of side slope m horizontal : 1 vertical, the Froude number is given by

(A) $F = \frac{m}{\sqrt{gy}}$

(B) $F = \frac{v}{\sqrt{2gy}}$

(C) $F = \frac{v\sqrt{2}}{\sqrt{gy}}$

(D) $F = \frac{v}{\sqrt{gy}}$

90. Which situation corresponds to a Gradually Varied Flow (GVF) in an open channel?

(A) Abrupt water surface drop due to a spillway

(B) Steady change of flow depth due to mild slope and friction

(C) Constant depth of water at every section

(D) Sudden increase in velocity due to turbine discharge

91. When is the specific energy constant for non-uniform flow?

(A) Only when the bed is horizontal

(B) Only at the upstream end of the channel

(C) Only when the flow is laminar

(D) For all channel shapes regardless of bed profile

92. For which Froude number range does an undular jump typically occur, and what is a key feature?

(A) $2 \cdot 5 < F_1 \leq 4 \cdot 5$; surface is very rough and energy loss is maximum

(B) $1 \cdot 0 < F_1 \leq 1 \cdot 7$; water surface is undulating with very small ripple, and E_1 / E_2 is practically zero

(C) $1 \cdot 7 < F_1 \leq 2 \cdot 5$; large surface oscillations are present with high energy loss

(D) $F_1 > 9 \cdot 0$; water surface is extremely rough and choppy

93. Which statement about regime channel is true?

(A) Silting and scouring need no special attention.

(B) It is not easily possible in a river.

(C) Properly designed artificial channel can be a regime channel.

(D) All of the above

94. The distance between pedestrian crossing and the stop line at signalised intersection should be

(A) 4 m to 5 m

(B) 8 m to 10 m

(C) 10 m to 15 m

(D) 20 m to 30 m

95. To know the resistance of a bituminous material, the test carried out is known as

(A) viscosity test

(B) ductility test

(C) softening test

(D) penetration test

96. Traffic islands serve as shelters primarily for

(A) cyclists

(B) pedestrians crossing the road

(C) motorcyclists

(D) buses

97. A roundabout is considered most advantageous when the number of intersecting roads is

(A) two

(B) three

(C) between four and seven

(D) more than eight

98. What is the main purpose of mud jacking?

(A) Slope stabilization

(B) Earthquake resistance

(C) Raising and settling concrete slabs

(D) Waterproofing of bitumen roads

99. The longitudinal movement of the rails in a track is technically known as

(A) buckling

(B) hogging

(C) creeping

(D) None of the above

100. A temporary structure constructed in a river for excluding water from a given site to enable the building operation to be performed on dry surface is called

(A) caisson

(B) cofferdam

(C) well foundation

(D) raft foundation

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