

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

Serial No. 0250

TEST BOOKLET

CIVIL ENGINEERING

AE

Paper-II

Time Allowed : Two Hours

Maximum Marks : 200

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. PLEASE NOTE THAT IT IS THE CANDIDATE'S RESPONSIBILITY TO ENCODE AND FILL IN THE ROLL NUMBER, SUBJECT, SUBJECT CODE AND CENTRE CODE CAREFULLY AND WITHOUT ANY OMISSION OR DISCREPANCY AT THE APPROPRIATE PLACES IN THE OMR ANSWER SHEET. ANY OMISSION/DISCREPANCY WILL RENDER THE ANSWER SHEET LIABLE FOR REJECTION.
3. You have to enter your roll Number on the Test Booklet in the Box provided alongside. **DO NOT** write *anything else* on the Test Booklet.
4. This Test Booklet contains 100 items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case, you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
5. You have to mark your responses **ONLY** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. There is no penalty for wrong answers.

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1. A differential manometer is used to measure
 - (a) Velocity of air
 - (b) Membrane pressure
 - (c) Pressure in pipes
 - (d) Difference of pressures between two points in a pipe

2. The total pressure on an immersed surface inclined at an angle θ with the liquid surface is

- (a) $wA \cdot \sin\theta$
- (b) $w\bar{x} \cdot \sin\theta$
- (c) $wA\bar{x}$
- (d) $\frac{wA\bar{x}}{\sin\theta}$

Where w = Specific weight of the liquid

A = Area of the immersed surface, and

\bar{x} = Depth of the centre of gravity of the immersed surface from the liquid surface

3. The point at which the resultant pressure on an immersed surface acts, is known as
 - (a) Center of pressure
 - (b) Centre of depth
 - (c) Center of gravity
 - (d) Centre of immersed surface

4. The centre of pressure and the center of gravity of immersed surface

- (a) Exactly overlaps
- (b) Lies above
- (c) Lies below
- (d) Either of the above

5. The centre of pressure for a vertically immersed surface lies at a distance equal to η . Then η , is -

- (a) $\frac{A\bar{x}}{I_g}$ above the center of gravity
- (b) $\frac{I_g}{A\bar{x}}$ above the center of gravity
- (c) $\frac{A\bar{x}}{I_g}$ below the center of gravity
- (d) $\frac{I_g}{A\bar{x}}$ below the center of gravity

6. A vertical wall is subjected to a pressure due to a liquid, on one of its sides. The total pressure on the wall is

- (a) γH
- (b) $\gamma H/2$
- (c) $\gamma H^2/2$
- (d) $\gamma H^2/3$

where γ = specific weight of liquid, and H = Height of liquid

7. When a vertical wall is subjected to pressures due to a liquid on both sides, the resultant pressure is equal to the

- (a) Sum of the two pressures
 - (b) Difference of the two pressures
 - (c) Mean of the two pressures
 - (d) Maximum of the two pressures
8. The stability of a dam is checked for
- (a) Tension at the base
 - (b) Overturning of the dam
 - (c) Sliding of the dam
 - (d) All of the above
9. In a Kaplan turbine runner, the number of blades are generally between
- (a) 2 to 4
 - (b) 4 to 8
 - (c) 8 to 16
 - (d) 16 to 24
10. The power developed by a turbine is directly proportional to H^n such that
- (a) $n=1/2$
 - (b) $n=1$
 - (c) $n=3/2$
 - (d) $n=5/2$
11. The speed of a turbine runner is
- (a) Directly proportional to $H^{1/2}$
 - (b) Inversely proportional to $H^{1/2}$
 - (c) Directly proportional to $H^{3/2}$
 - (d) Inversely proportional to $H^{3/2}$
12. The discharge through a turbine is directly proportional to H^n such that
- (a) $n=-1/2$
 - (b) $n=-1$
 - (c) $n=-3/2$
 - (d) $n=-2$
13. Which of the following turbine is preferred for a specific speed of 60 to 300 revolutions per minute?
- (a) Francis turbine
 - (b) Pelton wheel
 - (c) Kaplan turbine
 - (d) None of the above
14. Which of the following turbine is preferred for 0 to 25 m head of water?
- (a) Pelton wheel
 - (b) Kaplan turbine
 - (c) Francis turbine
 - (d) None of the above
15. A Francis turbine is used when the available head of water is
- (a) 0 to 25 m
 - (b) 25 to 250 m
 - (c) Above 250 m
 - (d) All of the above
16. A turbine is required to develop 2000 h.p. at 300 r.p.m. under a head of 150 m. Which of the following turbine should be used?

- (a) Pelton wheel with one nozzle
 - (b) Pelton wheel with more nozzles
 - (c) Kaplan turbine or Francis turbine
 - (d) All of the above
17. When a tape of length (L) and weight (w) kg/m is stretched at its ends with a pull (P) kg. then the correction for sag required is
- (a) $\frac{wL}{12P}$
 - (b) $\frac{w^2L^2}{24P^2}$
 - (c) $\frac{w^3L^3}{24P^2}$
 - (d) $\frac{w^4L^4}{36P^2}$
18. The tension at which the effects of pull and sag for a tape are neutralized, is known as
- (a) Initial tension
 - (b) Absolute tension
 - (c) Surface tension
 - (d) None of the above
19. A line joining the apex of a triangle to some fixed point on the opposite side is called a
- (a) Tie line
 - (b) Check line
 - (c) Base line
 - (d) None of the above
20. A line joining some fixed points on the main survey framework, is called a
- (a) Check line
 - (b) Base line
 - (c) Tie line
 - (d) None of the above
21. A base line in a chain survey
- (a) Checks the accuracy of the framework
 - (b) Enables the surveyor to locate the interior details
 - (c) Fixes up the directions of all other lines
 - (d) None of the above
22. A plumb bob is appropriate
- (a) Measuring distances along slopes in a hilly country
 - (b) For accurate centering of a theodolite over a station mark
 - (c) For testing the verticality of ranging poles
 - (d) All of the above
23. In a well-conditioned triangle no angle should be less than
- (a) 30°
 - (b) 45°
 - (c) 60°
 - (d) 15°

24. When the position of a point is to be located accurately by a perpendicular offset, the direction of perpendicular is set out by means of
- Theodolite
 - Optical square
 - Dumpy level
 - Plane meter
25. The accuracy in laying down the perpendicular offsets and measuring them depends upon
- Scale of plotting
 - Length of offset
 - Importance of the object
 - All of the above
26. When its perpendicular direction is set out by an eye, the limiting length of the offset is
- 15 m
 - 18 m
 - 20 m
 - 10 m
27. The depth of root zone for rice crop is
- 50 cm
 - 90 cm
 - 1 m or more
 - 30 cm
28. Which of the following statement is correct
- In free flooding, the field is divided into a number of small sized plots which are practically level.
 - In furrow irrigation, the water is admitted between the rows of plants in the field.
 - In border strip method, the strips are separated by low levels.
 - None of the above
29. Sprinkler irrigation is adopted for the areas which are
- Level
 - Uneven
 - High
 - Low
30. The hydrology is a science which deals with the
- Occurrence and distribution of water on the earth
 - Distribution and movement of water on the earth
 - Movement of water on the earth
 - Occurrence movement and distribution of water on the earth
31. The fall of moisture from the atmosphere to the earth surface in any form is called
- Evaporation
 - Precipitation
 - Transpiration
 - None of the above

32. The hydrology cycle is expressed by the equation
- $P = E - R$
 - $P = E + R$
 - $P = E \times R$
 - $P = E / R$
- where P = Precipitation E = Evaporation, and R = Run-off.
33. The precipitation caused by natural rising of warmer lighter air in colder and denser surroundings is called
- Convective precipitation
 - Orographic precipitation
 - Cyclonic precipitation
 - None of the above
34. The process of losing water from the leaves of plants is termed as
- Surface evaporation
 - Water surface evaporation
 - Transpiration
 - Precipitation
35. According to Dicken's formula, the flood discharge (Q) in cumecs is given by
- $Q = CA^{2/3}$
 - $Q = CA^{3/4}$
 - $Q = CA^{5/6}$
 - $Q = CA^{7/8}$
- where C = flood coefficient, and A = Area of basin in sq km.
36. For Madras catchments, the flood discharge is estimated from $Q = CA^{2/3}$. This formula is known as
- Dicken's formula
 - Ryve's formula
 - Nawab Jang Bhadur formula
 - Inglis formula
37. According to Manning's formula, the flood discharge (Q) in cumecs is given by
- $Q = CA^{2/3}$
 - $Q = CA^{3/4}$
 - $Q = CA^{5/6}$
 - $Q = CA^{7/8}$
- where C = flood coefficient, and A = Area of basin in sq km.
38. Inglis formula is used for estimating flood discharge for
- The catchments of former Bombay Presidency
 - The catchments of old Hyderabad State
 - The Madras catchments
 - None of the above
39. The design period for a water supply project is taken as
- 5 to 10 years
 - 10 to 15 years
 - 15 to 20 years
 - 20 to 30 years

40. The water mains should be designed for one of the following average daily water requirement
 - (a) 50%
 - (b) 75%
 - (c) 225%
 - (d) 325%
41. When in the pervious strata, the surface of water surrounding the well is at atmospheric pressure, the well is known as
 - (a) Gravity well
 - (b) Artesian well
 - (c) Open well
 - (d) Deep well
42. Suspended impurities consist of
 - (a) Iron and chlorine
 - (b) Bacteria and chlorine
 - (c) Bacteria and turbidity
 - (d) All of the above
43. Dissolved impurities consist of
 - (a) Bacteria
 - (b) Iron
 - (c) Silt
 - (d) Fungus
44. The presence of bacteria in water causes
 - (a) Hardness
 - (b) Alkalinity
 - (c) Diseases
 - (d) Bad taste
45. Colloidal impurities if associated the organic matter having bacterias, becomes the chief source of
 - (a) Hardness
 - (b) Epidemic
 - (c) Alkalinity
 - (d) Bad taste
46. The presences of calcium and magnesium salts in water causes
 - (a) Softening and salinity
 - (b) Softening and bad taste
 - (c) Hardness, bad taste and salinity
 - (d) Hardness
47. The sodium carbonate in water
 - (a) Causes bad taste and salinity
 - (b) Softens the water
 - (c) Increases hardness and salinity of water
 - (d) Antibacterial
48. The presence of the following causes red colour in water.
 - (a) Iron and cobalt
 - (b) Iron and manganese
 - (c) Sodium fluoride and nitrate
 - (d) Calcium carbonate and sulphide
49. The presence of hydrogen sulphide in water causes

- (a) Softening and alkalinity
 - (b) Softening and acidity
 - (c) Acidity
 - (d) Hardening and alkalinity
50. Turbidity of water is expressed in terms of
- (a) Silica scale
 - (b) Platinum cobalt scale
 - (c) Nautical value
 - (d) None of the above
51. The thickness of base, in no case, should be more than
- (a) 10 cm
 - (b) 15 cm
 - (c) 20 cm
 - (d) 30 cm
52. The highest point on road surface is called
- (a) Crown and camber
 - (b) Camber
 - (c) Gradient
 - (d) Berm
53. The slope of the line joining the crown and edge of the road surface is known as
- (a) Cross-fall
 - (b) Cross-slope
 - (c) Camber
 - (d) Any one of the above
54. A camber of 1 in 30 means that for a 30 m wide road, the crown of the road will be above the edge of the road as
- (a) 0.5 m
 - (b) 0.75 m
 - (c) 1 m
 - (d) 1.5 m
55. The thickness of road surfacing depends upon the
- (a) Type of traffic and intensity of traffic
 - (b) Type of material, type of traffic and intensity of traffic
 - (c) Type of material and intensity of traffic
 - (d) Temperature and humidity
56. The main object of providing a camber is
- (a) To make the road surface impervious
 - (b) To make the road surface durable
 - (c) To drain off rain water from road surface as quickly as possible
 - (d) All of the above
57. In scanty rainfall areas, the camber provided will be
- (a) Flatter
 - (b) Steeper
 - (c) Zero
 - (d) None of the above

58. On kankar road the camber generally provided is
- 1 in 24 to 1 in 30
 - 1 in 30 to 1 in 48
 - 1 in 48 to 1 in 60
 - 1 in 60 to 1 in 80
59. On cement concrete roads, the camber generally provided is
- 1 in 70 to 1 in 80
 - 1 in 60 to 1 in 80
 - 1 in 70
 - 1 in 60
60. A camber consisting of two straight slopes joining at the centre is called
- Barrel camber
 - Sloped camber
 - Composite camber
 - None of the above
61. Steeper camber may cause of the following in central portion of the road surface.
- Deterioration
 - Protection
 - Safety
 - Improvement
62. Which of the following statement is wrong?
- The amount of camber depends upon the rainfall of that area in which the road is to be constructed.
 - The steeper the camber of road, the more inconvenient it is for the traffic.
 - On a pavement with parabolic camber, the angel of inclination of the vehicles will be more at the edges.
 - All of the above
63. A vehicle while passing from a straight to a curved path, is under the influence of the
- Weight of vehicle
 - Centrifugal force
 - Gravitational resistance
 - Both (a) and (b)
64. The inward tilt given to the cross-section of the road surface, throughout the length of the horizontal curve, is known as
- Super-elevation
 - Cant
 - Banking
 - All of the above
65. The raising of outer edge of the road above the inner edge is known as
- Super-elevation
 - Cant
 - Banking
 - All of the above

66. Super-elevation is expressed as
- The difference of heights of two edges of the carriage-way to the width of the carriage-way
 - The difference of radii of curves
 - The difference of the road gradients
 - None of the above
67. Between two rails, a gap of following is provided for free expansion of the rails due to rise in temperature.
- 1.5 to 3 mm
 - 3 mm to 6 mm
 - 6 mm to 9 mm
 - 9 mm to 12 mm
68. No sleeper is placed just below the rail joint, as it will cause
- More impact
 - Discomfort to passengers
 - Either (a) or (b)
 - Both (a) and (b)
69. A welded rail joint is generally
- Supported on a sleeper
 - Suspended
 - Supported on a metal plate
 - None of the above
70. To reduce the wearing of rails, the rails are placed at an
- Inward slope of 1 in 20
 - Outward slope of 1 in 20
 - Inward slope of 1 in 30
 - Outward slope of 1 in 30
71. To prevent the flanges of wheels from rubbing the inside face of the rail, the distance between the inside edges of flange is kept at the following gauge.
- Equal to
 - Less than
 - More than
 - None of the above
72. In coning of wheels, the wheels are given a slope of
- 1 in 20
 - 1 in 25
 - 1 in 30
 - 1 in 40
73. Due to the coning of wheels, the pressure of wheel is always near the inner edge of rail
- Higher
 - Lower
 - Equal
 - Depends upon soil type
74. Which of the following statement is wrong?
- The coning of wheel is provided for smooth running of trains.
 - The coning of wheel prevents the wear of the inner faces of rails

- (c) If the axle moves laterally towards one rail the diameter of wheel rim increases on that rail
 - (d) On curves, the outer wheel has to travel lesser distance than the inner wheel.
75. The rails are laid without bending, at flat curves, where the degree of curve is
- (a) Less than 3°
 - (b) Equal to 3°
 - (c) More than 3°
 - (d) None of the above
76. The distance between two adjoining axles fixed in a rigid frame is known as
- (a) Gauge
 - (b) Wheel base distance
 - (c) Creep
 - (d) Both (a) and (b)
77. The gauge is widened on curves for more than
- (a) 4° curvature
 - (b) $4\frac{1}{2}^\circ$ curvature
 - (c) 5° curvature
 - (d) $5\frac{1}{2}^\circ$ curvature
78. The gauge should have following slack for curves of more than 438 m.
- (a) 6 mm
 - (b) 12 mm
 - (c) 20 mm
 - (d) 30 mm
79. The longitudinal movement of the rails in a track is technically known as
- (a) Buckling
 - (b) Hogging
 - (c) Creeping
 - (d) None of the above
80. In hogging
- (a) The rail ends get bent down and deflected due to loose packing under the joints
 - (b) The rails get out of their original positions due to insufficient expansion joint gap
 - (c) The longitudinal movement of the rails in track takes place
 - (d) All of the above
81. Which of the following clay mineral has maximum swelling in presence of water
- (a) Kalonite
 - (b) Montmorillonite
 - (c) Illite
 - (d) All of the above
82. Gravel and sand is a
- (a) Cohesive coarse grained soil
 - (b) Cohesive fine grained soil
 - (c) Non-cohesive coarse grained soil
 - (d) Non-cohesive fine grained soil

83. The specific gravity of sandy soils is
- 1.2
 - 1.8
 - 2.2
 - 2.7
84. If w is the water content and γ is the unit weight of soil mass, then the unit weight of dry soil (γ_{dry}) is equal to
- $\frac{w}{\gamma} + 1$
 - $\frac{\gamma}{w} + 1$
 - $\frac{\gamma}{1 + w}$
 - $\frac{1 + w}{\gamma}$
85. The unit weight of a completely saturated soil is given by
- $\frac{(G + e) \gamma_w}{1 + e}$
 - $\frac{(1 + e) \gamma_w}{G + e}$
 - $\frac{(G - e) \gamma_w}{1 + e}$
 - $\frac{(1 - e) \gamma_w}{G + e}$
- where G = specific gravity of soil
 e = void ratio, and
 γ_w = unit weight of water
86. Stoke's law is applicable for
- Spherical soil solids
 - Granular and flaky soil in suspension
 - Average particle size in Brownian movement
 - All of the above
87. Hydrometer analysis is used to determine the density of soil suspension if
- Soil contains particles finer than 75μ
 - Soil contains particles finer than 60μ
 - Soil contains particles finer than 10μ
 - All of the above
88. The standard temperature at which the Hydrometer analysis performed, it requires correction for
- Temperature only
 - Meniscus only
 - Dispersing agent only
 - All of the above
89. The smallest sieve size according to Indian Standard is
- 0.0075 mm
 - 0.045 mm
 - 0.75 mm
 - 0.154 mm

90. Sieving is not practicable for grain sizes smaller than about
- (a) 0.075 mm
 - (b) 0.095 mm
 - (c) 1.15 mm
 - (d) 0.2 mm
91. In a Raymond pile
- (a) The length varies from 6 to 12 m
 - (b) The diameter at the top varies from 40 to 60 cm and the diameter at the base varies from 20 to 28 cm
 - (c) The thickness of the outer shell depends upon the pile diameter on site conditions
 - (d) All of the above
92. The diameter of the drilled piles should not exceed
- (a) 20 cm
 - (b) 40 cm
 - (c) 60 cm
 - (d) 80 cm
93. A steel pile which function more efficiently in soft clay or loose sand, is
- (a) H-pile and pipe pile
 - (b) Screw pile and pin pile
 - (c) Pin pile and pipe pile
 - (d) Slotted piles
94. Sheet piles are made of
- (a) Wood and steel
 - (b) Steel and concrete
 - (c) Concrete and wood
 - (d) Any of the above
95. The coefficient of friction between the concrete and soil is
- (a) 0.15
 - (b) 0.15 to 0.20
 - (c) 0.20 to 0.25
 - (d) 0.30 to 0.35
96. When the pile is required to penetrate the beds of hard soil or soft rock to reach its required depth, the best method of driving the pile is by
- (a) Drop hammer and steam hammer
 - (b) Water jets and drop hammer
 - (c) Water jets and steam hammer
 - (d) Boring
97. When the pile is driven by means of water jets, water is forced through the jet pipe under a pressure of
- (a) 2 to 5 kg/cm²
 - (b) 5 to 7 kg/cm²
 - (c) 7 to 17.5 kg/cm²
 - (d) 17.5 to 25 kg/cm²
98. When the depth of water is from 4.5 to 6 m, the type of cofferdam used is
- (a) Rock fill cofferdam
 - (b) Earth filled cofferdam
 - (c) Double walled cofferdam
 - (d) Single walled cofferdam

99. According to Rankine's formula, the minimum depth of foundation should be

(a) $\frac{p}{w} \left(\frac{1 - \sin \phi}{1 + \sin \phi} \right)^2$

(b) $\frac{p}{w} \left(\frac{1 + \sin \phi}{1 - \sin \phi} \right)^2$

(c) $\frac{p}{w} \left(\frac{1 + \tan \phi}{1 - \tan \phi} \right)^2$

(d) $\frac{p}{w} \left(\frac{1 - \tan \phi}{1 + \tan \phi} \right)^2$

where p = safe permissible pressure on base in kg/m^2

w = weight of soil in kg/m^3 , and

ϕ = angle of repose of the soil

100. The minimum depth of foundation for the load bearing wall of a building is restricted to

(a) 1000 mm

(b) 750 mm

(c) 650 mm

(d) 900 mm