



AERTM

QUESTION BOOKLET

CIVIL ENGINEERING

PAPER - II (03)

Time Allowed : 2 Hours

Maximum Marks : 200

INSTRUCTIONS FOR CANDIDATES

1. Please do not open this Question Booklet until you are told to do so.
2. Candidate must fill up the necessary informations in the space provided on the OMR answer sheet before commencement of the examination.
3. Answer sheet will be processed by electronic device. Invalidation of answer sheet due to incomplete / incorrect filling of relevant circle of Roll No. and Question Booklet Series in the OMR answer sheet shall result in cancellation of candidature. Any deficiency in filling up OMR answer sheet will be the sole responsibility of the candidate.
4. An example is given below how to fill / mark (darken) Roll No. 41311706 and Question Booklet Series - B. Accordingly, you have to fill / mark (darken) the Roll No. and Question Booklet Series given to you in your OMR answer sheet.

EXAMPLE

Roll No.								Question Booklet Series
4	1	3	1	1	7	0	6	B
1	2	2	2	2	2	2	2	A ☐
2	3	3	3	3	3	3	3	B ☒
3	4	4	4	4	4	4	4	C ☐
4	5	5	5	5	5	5	5	D ☐
5	6	6	6	6	6	6	6	
6	7	7	7	7	7	7	7	
7	8	8	8	8	8	8	8	
8	9	9	9	9	9	9	9	
9	0	0	0	0	0	0	0	



5. For marking the correct answer, darken one circle by **BLUE BALLPOINT PEN** only.
6. Please do not mark (darken) more than one circle. Darkening more than one circle against an answer will be treated as wrong answer.
7. Do not detach any leaf from this Question Booklet. After the examination, hand over the OMR answer sheet to the Room Invigilator. You are allowed to take the Question Booklet and carbon copy of the OMR answer sheet after examination is over.
8. Each question carries 2 marks. There is no negative marking for any wrong answer.
9. Possession and use of Calculator, Mobile Phone, Pager or any other electronic gadget is strictly prohibited in the Examination Hall.
10. Please abide by the instructions above and those given on the OMR answer sheet, failure to comply these instructions will be sole responsibility of the candidates.



03 - D

1. A water treatment plant treats 4000 cubic metres water per day. If it consumed 20 kg of chlorine per day, then the chlorine dosage would be
 - (A) 10 mg/l
 - (B) 5.0 mg/l
 - (C) 0.50 mg/l
 - (D) 0.25 mg/l
2. The two chambered tank in which the upper one is used for sedimentation and the lower for digestion is
 - (A) Imhoff tank
 - (B) Septic tank
 - (C) Detritus tank
 - (D) Sedimentation tank
3. Egg shaped sewer are preferred to circular shaped sewer because
 - (A) they possess better hydraulic properties.
 - (B) they resist soil erosion.
 - (C) velocity remains higher even at low discharge.
 - (D) None of these
4. Which one of the following sewage treatment unit has a Parshall flume ?
 - (A) Trickling filter
 - (B) Oxidation ditch
 - (C) Grit chamber
 - (D) Aerated lagoon
5. Dechlorination of water is achieved by adding
 - (A) Sodium thiosulphate
 - (B) Sodium sulphite
 - (C) Sodium bisulphate
 - (D) All of these
6. Which of the following mechanism is not responsible for removing colloidal particles from raw water, during the process of coagulation and flocculation ?
 - (A) Ionic layer compression
 - (B) Adsorption and interparticle bridging
 - (C) Schmutzdecke
 - (D) Charge neutralization
7. The correct relation between theoretical oxygen demand, biochemical oxygen demand and chemical oxygen demand is
 - (A) $TOD > BOD > COD$
 - (B) $TOD > COD > BOD$
 - (C) $BOD > COD > TOD$
 - (D) $COD > BOD > TOD$
8. Bleaching powder is
 - (A) Slaked lime
 - (B) Chloride of lime
 - (C) Hypo-chloride of lime
 - (D) Hypo-chlorite of lime

9. Free board in lined canals is measure between
 - (A) FSL and top of lining
 - (B) FSL and top of canal bank
 - (C) Top of lining and top of canal bank
 - (D) None of these
10. Which of the following is not a remedial measure for water logging ?
 - (A) Good drainage for irrigated land.
 - (B) Conjunctive use of water in the basin.
 - (C) Lining of canals and water course.
 - (D) Contour bunding.
11. The 'Meander length' for an alluvial river is
 - (A) the total channel length along its looped course.
 - (B) the total channel length minus the direct straight length.
 - (C) the axial length of one meander.
 - (D) None of these
12. A dam reservoir, not provided with gate controls on its spillway and other sluices, is called a
 - (A) Detention basin
 - (B) Storage reservoir
 - (C) Retarding basin
 - (D) All of these
13. The capacity of a storage reservoir can be decided by using
 - (A) The mass curve of inflow
 - (B) The mass curve of outflow
 - (C) By both (A) and (B) together
 - (D) None of these
14. Total Kjeldahl Nitrogen (TKN) concentration in domestic sewage is the sum of the concentration of
 - (A) organic and Inorganic nitrogen in sewage.
 - (B) organic nitrogen and nitrate in sewage.
 - (C) organic nitrogen and ammonia in sewage.
 - (D) ammonia and nitrate in sewage.
15. Which of the following method of analysis of water distribution system is most suitable for long and narrow pipe system ?
 - (A) Circle method
 - (B) Equivalent pipe system
 - (C) Hardy cross method
 - (D) Electrical analysis method
16. High bacterial removal by slow sand filter is accomplished by
 - (A) Mechanical straining
 - (B) Electrolytic chamber
 - (C) Filtration
 - (D) Schmutzdecke

17. The shape of the recession limb of a hydrograph depends on
- (A) Basin as well as storm characteristics
 - (B) Storm characteristics only
 - (C) Basin characteristics only
 - (D) Base flow only
18. An isochrone is a line on the basin map
- (A) joining rain gauge stations with equal rainfall duration.
 - (B) joining points having equal standard time.
 - (C) connecting points having equal time of travel of the surface runoff to the catchment outlet.
 - (D) that connects points of equal rainfall depth in a given time interval.
19. Kor-Watering is the irrigation water supplied to a crop
- (A) at the time of its sowing.
 - (B) just before harvesting.
 - (C) about three weeks after sowing.
 - (D) about three weeks before harvesting.
20. Consumptive use of water for a crop represents
- (A) The transpiration needs of the crop.
 - (B) Evaporation needs of the cropped area.
 - (C) Evaporation needs of the cropped area plus the minor quantity required in plant metabolism.
 - (D) None of these
21. The amount of irrigation water required to meet evapotranspiration needs of the crop during its full growth is called
- (A) Effective rainfall
 - (B) Consumptive use
 - (C) Consumptive irrigation requirement
 - (D) Net irrigation requirement
22. The Garret's diagram are based on
- (A) Lacey's theory
 - (B) Khosla's theory
 - (C) Bligh's theory
 - (D) Kennedy's theory
23. In an irrigation canal, berms are provided at
- (A) Natural Surface Level
 - (B) Full Supply Level
 - (C) Bank Level
 - (D) None of these

24. Cross-regulators in main canals are provided to
- (A) regulate water supply in the off-taking channel.
 - (B) regulate water supply in the main channel.
 - (C) regulate excessive flood water.
 - (D) head up water for adequate supply into the off-taking channel.
25. The main function of a diversion head works of a canal from a river is
- (A) to raise water level.
 - (B) to control floods.
 - (C) to store water.
 - (D) to remove silt.
26. The normal annual rainfall at stations A, B and C situated in meteorologically homogeneous region are 175 cm, 180 cm and 150 cm respectively. In the year 2000, station B was inoperative and stations A and C recorded annual precipitations of 150 cm and 135 cm respectively. The annual rainfall at station B in that year could be estimated to be nearly
- (A) 150 cm
 - (B) 143 cm
 - (C) 158 cm
 - (D) 168 cm
27. Lysimeter is used to measure
- (A) Infiltration
 - (B) Evaporation
 - (C) Evapotranspiration
 - (D) Vapour pressure
28. The surface velocity at any vertical section of a stream is
- (A) not of any use in stream flow measurement.
 - (B) smaller than the mean velocity in that vertical.
 - (C) larger than the mean velocity in that vertical section.
 - (D) equal to the velocity in that vertical at 0.6 times the depth.
29. If in a flow-mass curve, a demand line drawn tangent to the lowest point in a valley of the curve does not intersect the mass curve at an earlier time period, it represents that
- (A) the storage is inadequate.
 - (B) the reservoir will not be full at the start of the dry period.
 - (C) the reservoir is full at the beginning of the dry period.
 - (D) the reservoir is wasting later by spill.

30. The pipe which carries water under pressure from reservoir to turbine is called
- Scroll case pipe
 - Draft tube
 - Pen stock
 - None of these
31. In a turbulent pipe flow, inside the laminar layer the velocity distribution is
- Parabolic
 - Linear
 - Logarithmic
 - Exponential
32. The boundary layer separation takes place if
- pressure gradient is zero.
 - pressure gradient is positive.
 - pressure gradient is negative.
 - None of these.
33. The channel whose boundary is not deformable is known as
- Rigid channel
 - Prismatic channel
 - Mobile channel
 - Boundary channel
34. A turbine is called reaction turbine if at the inlet of the turbine the total energy is
- Kinematic energy only
 - Kinetic energy and pressure energy
 - Pressure energy only
 - None of these
35. The type of cross drainage work to be provided when a canal passes over the drainage is
- Super-passage
 - Level crossing
 - Aqueduct
 - Inlets and outlets
36. Which one of the following equations represents the d/s profile of ogee spillway with vertical u/s face ? (x, y) are the coordinates of the point on the d/s profile with origin at the crest of the spillway and H_d is the design head ?
- $x^{1.85} = 2(H_d)^{0.85}y$
 - $y^{1.85} = 2(H_d)^{0.85}x$
 - $x^{0.85} = 2(H_d)^{1.85}y$
 - $y^{0.85} = 2(H_d)^{1.85}x$

37. A moving fluid mass may be brought to a static equilibrium position, by applying an imaginary inertia force of the same magnitude as that of the accelerating force but in the opposite direction. This statement is called
- Pascal's law
 - Archimedes's principle
 - D'Alembert's principle
 - None of these
38. If the ratios of the corresponding forces acting at corresponding points are equal, then the model and prototype are said to have
- Geometric similarity
 - Kinematic similarity
 - Dynamic similarity
 - None of these
39. Drag is defined as the force exerted by a flowing fluid on a solid boundary
- in the direction of flow.
 - perpendicular to the direction of flow.
 - in the direction which is at angle of 45° to the direction of flow.
 - None of these
40. A body is called stream lined body when it is placed in a flow and the surface of the body
- Coincides with streamlines.
 - Does not coincide with the streamlines.
 - Is perpendicular to the streamlines.
 - None of these
41. Cavitation will take place if the pressure of the flowing fluid at any point is
- more than vapour pressure of the fluid.
 - equal to vapour pressure of the fluid.
 - is less than vapour pressure of the fluid.
 - None of these
42. Pitot-tube is used to measure
- Discharge
 - Average velocity
 - Velocity at a point
 - Pressure at a point
43. The purpose of Priming is to
- Drive out water from sump
 - Fill the suction pipe with water
 - Fill the delivery pipe with water
 - Drive out air or gas or vapour from suction pipe, casing and part of delivery valve

44. The phenomenon occurring in an open channel when a rapidly flowing stream abruptly changes to slowly flowing stream causing a distinct rise of liquid surface is
- (A) Water hammer
 - (B) Hydraulic jump
 - (C) Critical discharge
 - (D) None of these
45. The depth of the flow at which specific energy is minimum is called
- (A) Normal depth
 - (B) Critical depth
 - (C) Alternate depth
 - (D) None of these
46. A current meter is a device used for measuring
- (A) Velocity
 - (B) Viscosity
 - (C) Current
 - (D) Pressure
47. Non-uniform flow may be caused by
- (A) The change in width, depth, bed slope etc. of the channel.
 - (B) An obstruction, across a channel of uniform width.
 - (C) Both (A) and (B)
 - (D) None of these
48. When the depth of flow changes gradually over a length of the channel, then the flow will be termed as
- (A) Rapidly varied flow
 - (B) Critical flow
 - (C) Gradually varied flow
 - (D) Uniform flow
49. For a given discharge in a horizontal frictionless channel two depths may have the same specific force. These two depths are known as
- (A) Specific depths
 - (B) Sequent depths
 - (C) Alternate depths
 - (D) Normal depth and critical depth
50. Development of surge in open channel is
- (A) Gradually varied flow
 - (B) Rapidly varied flow
 - (C) Steady flow
 - (D) Normal flow
51. The velocity at which the flow changes from laminar flow to turbulent flow is called
- (A) Critical velocity
 - (B) Velocity of approach
 - (C) Sub-sonic velocity
 - (D) Super-sonic velocity

52. The transverse component of wind at 90° angle with the direction of aircraft movement is known as
- (A) Head wind
 - (B) Cross wind
 - (C) Trail wind
 - (D) Wind
53. Identify the suitable expression for estimating Radius of the curve (R) from distance between midpoint of long chord and the apex point (V) and Chord length (C)
- (A) $R = (C^2/8V)$
 - (B) $R = (C^2/2V)$
 - (C) $R = (C^2/4V)$
 - (D) $R = (2C^2/V)$
54. Theodolites equipped with coaxial electronic distance measurement with high accuracy angle and distance measurement equipped with microprocessors to monitor instrument status, control advanced functions, and facilitate a wide variety of onboard software applications programs is
- (A) Electronic Theodolite
 - (B) Total Station .
 - (C) Optical Theodolite
 - (D) Differential global positioning system
55. Identify the correct sequence of signals that a loco pilot come across when a locomotive enters a Class A double line block station :
- (A) Warner – Home – Starter – Advance starter
 - (B) Starter – Advance starter – Home – Warner
 - (C) Home – Warner – Starter – Advance starter
 - (D) Advance starter – Starter – Home – Warner
56. Surveys which depicts the natural features of a country are known as
- (A) Engineering survey
 - (B) Cadastral survey
 - (C) Topographic survey
 - (D) Thematic survey
57. When contours of different elevation cross each other, it indicates
- (A) Vertical cliff
 - (B) Saddle
 - (C) Overhanging cliff
 - (D) None of these
58. The surface of still water is considered to be
- (A) Level
 - (B) Horizontal
 - (C) Smooth
 - (D) None of these

59. The difference between the equilibrium cant that is necessary for the maximum permissible speed on a curve and the actual cant provided is

- (A) Negative superelevation
- (B) Cant deficiency
- (C) Theoretical cant
- (D) Actual cant

60. Identify the suitable name of the equipment used and method for rapid levelling or levelling in rolling ground or for inaccessible points :

- (A) Dumpy level & Reciprocal levelling
- (B) Theodolite & Trigonometric levelling
- (C) Auto level & Contouring
- (D) Electronic distance meter & Tacheometry

61. The technique permits the surveyor to set up the total station at any convenient position and then to determine the co-ordinates and elevation of that instrument position by sighting previously co-ordinated reference stations is

- (A) Azimuth
- (B) Zenith
- (C) Resection
- (D) None of these

62. The standard equation used for determination of horizontal distance in stadia tacheometry considering K and C are the constants, is

- (A) $D = K + S \times C$
- (B) $D = K \times S + C$
- (C) $D = K \times C + S$
- (D) $D = K + S + C$

63. Identify the appropriate property of aggregate measured from the Los Angeles abrasion test and Impact test :

- (A) Hardness & Crushing strength
- (B) Toughness & Hardness
- (C) Hardness & Toughness
- (D) Toughness & Crushing strength

64. The type of structure built or naturally evolved parallel to the shoreline and designed to protect harbours from waves is known as

- (A) Sea walls
- (B) Groin
- (C) Jetties
- (D) Breakwaters

65. The gross weight of _____ commercial vehicle considered for the design of flexible pavement is _____.
- (A) Motorized, 150 kN & above
 - (B) Motorized, 30 kN & above
 - (C) Non-motorized, 10 kN & above
 - (D) Motorized, 50 kN & above
66. The mean speed of vehicles in a traffic stream at any instant of time over a certain pavement section is _____
- (A) Average speed
 - (B) Spot speed
 - (C) Time mean speed
 - (D) Space mean speed
67. For concrete pavements, _____ property of concrete is the design criteria.
- (A) Compressive strength
 - (B) Torsional strength
 - (C) Flexural strength
 - (D) Compressive and Flexural strength
68. The gradients used in the railways to overcome the falling gradient followed by raising gradient in valleys is known as _____
- (A) Pusher or helper gradient
 - (B) Minimum gradient
 - (C) Ruling gradient
 - (D) Momentum gradient
69. The rails that are provided parallel to the inner rail on sharp curves to reduce the lateral wear on the outer rail is known as _____ rails.
- (A) Tongue
 - (B) Lead
 - (C) Check
 - (D) Stock
70. Identify the suitable load transferring device from one rail section to the other rail section and also hold rails sections in vertical and horizontal plane at joints.
- (A) Bearing plates
 - (B) Fang bolts
 - (C) Fish plates with bolts
 - (D) Two way keys

71. A plate load test is useful to estimate
- (A) Bearing capacity of foundation
 - (B) Settlement of foundation
 - (C) Both bearing capacity and settlement of foundation
 - (D) None of these
72. The bearing capacity of soil supporting a footing of size $3\text{ m} \times 3\text{ m}$ will not be affected by the presence of water table located at a depth below the base of footing of
- (A) 1.0 m
 - (B) 1.50 m
 - (C) 3.0 m
 - (D) 6.0 m
73. The load carrying capacity of pile depends upon the
- (A) Skin friction
 - (B) Point resistance
 - (C) Both (A) and (B)
 - (D) Neither (A) nor (B)
74. The most commonly used shape of a well foundation is
- (A) Double D Well
 - (B) Circular Well
 - (C) Double Octagonal Well
 - (D) Rectangular Well
75. The allowable soil pressure for foundation in cohesive soils is generally controlled by
- (A) Settlements
 - (B) Bearing capacity
 - (C) Both (A) and (B)
 - (D) Neither (A) nor (B)
76. The group efficiency of driven piles in sand at a close spacing may be
- (A) Equal to 100%
 - (B) Greater than 100%
 - (C) Well below 100%
 - (D) None of these
77. In infinite slope and no seepage condition, stability of slope of cohesion less soil depends on
- (A) Height of the slope only
 - (B) Angle of internal friction only
 - (C) Both (A) and (B)
 - (D) None of these
78. The type of transition curve that satisfies the requirements of transition curve in Highways is
- (A) Cubic parabola
 - (B) Parabola
 - (C) Spiral
 - (D) Lemniscate

79. At shrinkage limit, the soil is
- Dry
 - Partially saturated
 - Fully saturated
 - None of these
80. The soil which plot above the A line in the plasticity chart are
- Clays
 - Silts
 - Sands
 - Organic soils
81. A constant head permeameter is used for
- Coarse grained soils
 - Silty Soils
 - Clayey Soils
 - Organic Soils
82. The Seepage pressure is proportional to
- Hydraulic gradient
 - Unit weight of water
 - Length of the specimen
 - All of these
83. The Westergaard analysis is used for
- Homogeneous soils
 - Cohesive soils
 - Sandy soils
 - Stratified soils
84. When consolidation of a saturated soil sample occurs, the degree of saturation
- Increases
 - Decreases
 - Remains constant
 - May increase or decrease
85. Dispersed type of soil structure is an arrangement comprising particles having
- face to face or parallel orientation.
 - edge to edge orientation.
 - edge to face orientation.
 - All of these
86. Stoke's law does not hold good if the size of the particles is
- Greater than 2.0 mm
 - Less than $0.2 \mu\text{m}$
 - Neither (A) nor (B)
 - Both (A) and (B)
87. Terzaghi's bearing capacity N_c , N_q and N_γ are functions of
- Cohesion only
 - Angle of internal friction only
 - Both cohesion and angle of internal friction
 - None of these

88. A city supply of 15000 cubic meters of water per day is treated with a chlorine dosage of 0.5 ppm. For this purpose, the requirement of 25% bleaching powder per day would be

- (A) 300 kg
- (B) 75 kg
- (C) 30 kg
- (D) 7.5 kg

89. If B.O.D of a city is 20000 kg per day and B.O.D. per capita per day is 0.05 kg, then population equivalent of city is

- (A) 1000
- (B) 4000
- (C) 100000
- (D) 400000

90. In a B.O.D. test, 1.0 ml of sewage diluted to 100 ml, and the dissolved oxygen concentration of diluted sample at the beginning was 10 mg/l and 2 mg/l after five days of incubation at 20 °C. The B.O.D. of the given raw sample of sewage will be

- (A) 800 mg/l
- (B) 10 mg/l
- (C) 100 mg/l
- (D) 8 mg/l

91. The clay mineral with the largest swelling and shrinkage characteristics is

- (A) Kaolinite
- (B) Illite
- (C) Montmorillonite
- (D) None of these

92. The ratio of volume of voids to the volume of solids of soil is

- (A) Void ratio
- (B) Degree of saturation
- (C) Air content
- (D) Porosity

93. Physical properties of a permeant which influence permeability are

- (A) Viscosity only
- (B) Unit weight only
- (C) Both viscosity and unit weight
- (D) None of these

94. For a well graded sand, the co-efficient of curvature should be

- (A) More than 3.0
- (B) Between 1 and 3
- (C) Less than 3
- (D) None of these

95. Air-binding phenomenon in rapid sand filters may occur due to
- excessive negative head
 - mud ball formation
 - higher turbidity in the effluents
 - low temperature
96. The maximum permissible limit in absence of alternate source (IS 10500-2012) for fluoride (as F in mg/l) in drinking water is
- 1.5
 - 0.5
 - 5.0
 - 10
97. The process of aeration in water treatment plant is mainly responsible for removing
- CO₂ and H₂S
 - Fe and Mn
 - Odour
 - All of these
98. If the total hardness and alkalinity of a sample of water are 350 mg/l and 150 mg/l (CaCO₃) respectively, then its carbonate and non-carbonate hardness (in units of mg/l) will be
- 150 and 200
 - 200 and 150
 - 350 and 150
 - 350 and zero
99. If P is the population of a place in thousands then, the fire demand of water in litres per minute, according to National Board of Fire underwriters formula is given by
- $5663 \sqrt{P}$
 - $3182 \sqrt{P}$
 - $8640 \sqrt{P}$
 - $4637 \sqrt{P} (1-0.01 \sqrt{P})$
100. The composition of a certain municipal solid waste sample and specific weights of its various components are given below :

Components	Percent by weight	Specific weight (kg/m ³)
Food and vegetable waste	50	300
Refuse (Dry waste)	30	500
Plastic waste	10	65
Wood and yard waste	10	125

Specific weight of municipal solid waste is _____ (kg/m³)

- 319
- 217
- 209
- 199