



QUESTION BOOKLET CIVIL ENGINEERING

Time Allowed : 2 Hours

PAPER-II (03)

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	2	2	2	2	2	2	2	B ☒
3	2	2	2	2	2	2	2	C ☐
4	2	2	2	2	2	2	2	D ☐
5	2	2	2	2	2	2	2	
6	2	2	2	2	2	2	2	
7	2	2	2	2	2	2	2	
8	2	2	2	2	2	2	2	
9	2	2	2	2	2	2	2	
0	2	2	2	2	2	2	2	

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.



1. Hydraulic turbines are the machines which convert water energy into
 - (A) mechanical energy
 - (B) electrical energy
 - (C) solar energy
 - (D) automatic energy
2. Reciprocating pumps are suitable for
 - (A) low discharge and high speed
 - (B) high discharge and low speed
 - (C) low discharge and low speed
 - (D) high discharge and high speed
3. To generate 8100 kW under a head of 81 m while working at a speed of 540 rpm, what type of turbine shall be most suitable ?
 - (A) Pelton
 - (B) Francis
 - (C) Kaplan
 - (D) Bulb
4. For a hydro-electric project with reaction turbine, the draft tube at the exit from the turbine is
 - (A) always above the water
 - (B) always immersed in water
 - (C) may either be above or below the water
 - (D) above or below the water depending on the speed of the turbine
5. The performance of a well is measured by its
 - (A) specific yield
 - (B) specific capacity
 - (C) storage coefficient
 - (D) permeability coefficient
6. The type of cross drainage work to be provided when a canal passes over the drainage is
 - (A) Super passage
 - (B) Level crossing
 - (C) Aqueduct
 - (D) Inlets and Outlets
7. A hydrograph is a plot of
 - (A) Precipitation against time
 - (B) Stream flow against time
 - (C) Surface run off against time
 - (D) Recorded run off against time
8. The s-curve can be used to obtain a unit hydrograph from that of
 - (A) A longer duration
 - (B) Normal duration
 - (C) Shorter duration
 - (D) Both (A) & (C)

9. In India, which of the following is adopted as standard recording rain gauge ?
- Symon's rain gauge
 - Fipping bucket type
 - Natural syphon type
 - Weight bucket type
10. Evapotranspiration depends on
- hours of bright sunshine
 - type of crop
 - method of irrigation
 - All of the above
11. Lining of irrigation channels
- increases the waterlogging area
 - decreases the waterlogging area
 - does not change the water logging area
 - None of the above
12. Cross regulators in main canals are provided to
- regulate water supply in the off-taking channel
 - regulate water supply in the main channel
 - regulate excessive flood water
 - head up water for adequate supply into the off-taking channel
13. The main function of a diversion headworks of a canal from a river is
- to raise water level
 - to control floods
 - to store water
 - to remove silt
14. Lysimeter is used for the measurement of
- Infiltration
 - Evaporation
 - Evapotranspiration
 - Vapour pressure
15. Double mass curves are used
- to check on the consistency of precipitation records
 - as basis for storm rainfall analysis
 - to determine average rainfall over an area
 - to indicate rainfall distribution
16. The surface velocity at any vertical section of a stream is
- not of any use in stream flow measurement
 - smaller than the mean velocity in that vertical
 - larger than the mean velocity in that vertical section
 - equal to the velocity in that vertical at 0.6 times the depth

17. Maximum possible discharge from a small catchment corresponding to particular rainfall intensity is independent of which one of the following :
- (A) Soil moisture condition
 - (B) Drainage characteristics of catchment
 - (C) Area of the catchment
 - (D) Duration of the rainstorm
18. 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
19. Probability of a 10 year flood to occur at least once in the next 4 years is
- (A) 25%
 - (B) 35%
 - (C) 50%
 - (D) 60%
20. For a given storm, other factors remaining same,
- (A) basin with large drainage densities give smaller flood peaks
 - (B) low drainage density basin give shorter time bases of hydrographs
 - (C) the flood peak is independent of the drainage density.
 - (D) basin having low drainage density give smaller peaks in flood hydrographs.
21. Return period refers to
- (A) the probability of exceedance of an event
 - (B) the probability of non-exceedance of an event
 - (C) the inverse of the probability of exceedance of an event.
 - (D) the inverse of the probability of non-exceedance of an event
22. The stream which does not have any base flow contribution is called
- (A) perennial stream
 - (B) intermittent stream
 - (C) ephemeral stream
 - (D) None of the above

23. Kor-Watering is the irrigation water supplied to a crop
- (A) at the time of its sowing
 - (B) about three weeks after sowing
 - (C) just before harvesting
 - (D) about three weeks before harvesting
24. Consumptive use refers to the loss of water as a result of
- (A) evaporation and transpiration
 - (B) crop water requirement
 - (C) evaporation and infiltration
 - (D) evaporation and transpiration from the cropped area
25. The Garret's diagram are based on
- (A) Lacey's theory
 - (B) Khosla's theory
 - (C) Bligh's theory
 - (D) Kennedy's theory
26. Which type of fall can be generally used for a moderate discharge of 40 to 60 cumec's and low fall heights of 1.0 m to 1.5 m ?
- (A) Vertical drop fall
 - (B) Ogee fall
 - (C) Glacis fall
 - (D) Baffle fall
27. The check dam is a
- (A) flood control structure
 - (B) soil conservation structure
 - (C) river training structure
 - (D) water storage structure
28. What type of cross drainage work is provided when the canal runs below the drain, with FSL of canal well below the bed of the drain ?
- (A) aqueduct
 - (B) super passage
 - (C) level crossing
 - (D) siphon aqueduct
29. Groynes are adopted for river bank protection works. When it is placed inclined downstream in the direction of flow in the river, it is designated as which one of the following ?
- (A) repelling groyne
 - (B) attracting groyne
 - (C) fixed groyne
 - (D) None of the above
30. For the water supply to a medium town, what is the daily variation factor ?
- (A) 1.5
 - (B) 2.5
 - (C) 3.0
 - (D) 3.5

31. The distribution mains are designed for
- (A) maximum daily demand
 - (B) maximum hourly demand
 - (C) average daily demand
 - (D) maximum hourly demand on maximum day
32. The concentration of OH^- ion in a water sample is measured as 17 mg/l at 25 °C. What is the pH of the water sample ?
- (A) 10
 - (B) 11
 - (C) 12
 - (D) 13
33. Which one of the following tests of water/waste water employs Erichrome Black T as an indicator ?
- (A) COD
 - (B) Residual chlorine
 - (C) Hardness
 - (D) DO
34. 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
35. High bacterial removal by slow sand filter is accomplished by
- (A) mechanical straining
 - (B) electrolytic chamber
 - (C) filtration
 - (D) schmutzdecke
36. The cleaning of slow sand filter is done by
- (A) reversing the direction of flow of water.
 - (B) passing air through the filter.
 - (C) passing a solution of alum and lime through the filter.
 - (D) scraping off top layers of sand and admitting water.
37. In a water treatment plant, dissolved iron and manganese can be removed from the water by
- (A) aeration and sedimentation
 - (B) aeration and flocculation
 - (C) aeration and coagulation
 - (D) aeration

38. Which one of the following is not a specific criterion for calculating surface overflow rate in sedimentation tank design ?
- (A) total quantity of water to be treated
 - (B) total surface area available in the tank
 - (C) total length of the tank
 - (D) total depth of the tank
39. Which of the following chemicals is employed for dechlorination of water ?
- (A) sodium bicarbonate
 - (B) sodium sulphite
 - (C) calcium carbonate
 - (D) calcium bicarbonate
40. A water treatment plant treats 5000 cubic meters water per day. If it consumes 20 kg of chlorine per day, then the chlorine dosage would be
- (A) 2.5 mg/l
 - (B) 4.0 mg/l
 - (C) 10.0 mg/l
 - (D) 25.0 mg/l
41. Consider the following treatment process units in a water treatment plant :
- (1) Coagulation
 - (2) Disinfection
 - (3) Sedimentation
 - (4) Filtration
- Which is the correct sequence of the process unit in the water treatment plant ?
- (A) 2 - 4 - 3 - 1
 - (B) 1 - 4 - 3 - 2
 - (C) 2 - 3 - 4 - 1
 - (D) 1 - 3 - 4 - 2
42. Egg shaped sewer is preferred to circular shaped sewer because
- (A) they possess better hydraulic properties
 - (B) they resist soil erosion
 - (C) velocity remains higher at low discharge
 - (D) None of the above
43. Which of the following sewage treatment unit has a Parshall flume ?
- (A) trickling filter
 - (B) oxidation ditch
 - (C) grit chamber
 - (D) aerated lagoon

44. Which of the following statement is correct ?

A combined sewer is one which transports domestic sewage and

- (A) storm water
- (B) Industrial water
- (C) overhead flow
- (D) industrial waste and storm water

45. Bleaching powder is known as

- (A) hypo-chloride of lime
- (B) hypo-chlorite of lime
- (C) chloride of lime
- (D) slaked lime

46. Sewage sickness occurs when

- (A) sewage contains pathogenic organisms
- (B) sewage enters the water supply system
- (C) sewage gets clogged due to accumulation of solids
- (D) voids of soil clogged due to continuous application of sewage on the piece of a land

47. The ultimate BOD value of a waste

- (A) increases with temperature
- (B) decreases with temperature
- (C) remains the same at all temperatures
- (D) doubles with every 10 °C rise of temperature

48. If B.O.D. of a city is 20,000 kg per day and B.O.D. per capita per day is 0.05 kg, then population equivalent of city is

- (A) 400000
- (B) 40000
- (C) 4000
- (D) 1000

49. Eutrophication of water bodies is caused by the

- (A) discharge of toxic substances
- (B) excessive discharge of nutrients
- (C) excessive discharge of suspended solids
- (D) excessive discharge of chlorides

50. From ecological considerations, the minimum level of dissolved oxygen necessary in the rivers and streams is
- (A) 1 mg/litre
 - (B) 2 mg/litre
 - (C) 4 mg/litre
 - (D) 8 mg/litre
51. In the oxidation ditch, the excess sludge is taken to
- (A) anaerobic digester
 - (B) aerobic digester
 - (C) drying beds
 - (D) incinerator
52. Aerosol is
- (A) carbon particles of microscopic size
 - (B) dispersion of small solid or liquid particles in gaseous media
 - (C) finely divided particles of ash
 - (D) diffused liquid particles
53. Which one of the following procedure is used for sampling of the flue gas in a chimney for SPM ?
- (A) isothermal sampling
 - (B) adiabatic condition
 - (C) variable rate of sampling
 - (D) isokinetic sampling
54. A soil has a liquid limit of 60%, plastic limit of 35% and shrinkage limit of 20%. If has a natural moisture content of 50%. The liquidity index of soil is
- (A) 0.40
 - (B) 0.60
 - (C) 1.25
 - (D) 1.50
55. The clay mineral with the largest swelling and shrinkage characteristics is
- (A) Kaolinite
 - (B) Illite
 - (C) Montmorillonite
 - (D) None of the above
56. 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 the above
57. For a well graded sand, the coefficient of curvature should be
- (A) More than 3.0
 - (B) Between 1 and 3
 - (C) Less than 3
 - (D) None of the above

58. A soil has a liquid limit of 45% and lies above the A - line when plotted on a plasticity chart. The group symbol of the soil as per IS soil classification is
- (A) CH
 - (B) CI
 - (C) CL
 - (D) MI
59. A soil has discharge velocity of 5×10^{-7} m/sec and a void ratio of 0.50. Its seepage velocity will be
- (A) 15×10^{-7} m/s
 - (B) 20×10^{-7} m/s
 - (C) 25×10^{-7} m/s
 - (D) 30×10^{-7} m/s
60. Sheep-foot rollers are recommended for compacting
- (A) Granular soils
 - (B) Cohesive soils
 - (C) Sandy soils
 - (D) Any type of soil
61. The change in vertical stress in a soil mass estimated by Boussinesq's equation when Poisson's ratio changes from 0.3 to 0.45 will be
- (A) reduction by 30%
 - (B) increase by 50%
 - (C) decrease by 50%
 - (D) no change
62. The Westergaard analysis is used for
- (A) Homogeneous soils
 - (B) Cohesive soils
 - (C) Sandy soils
 - (D) Stratified soils
63. An undrained triaxial compression test is carried out on a saturated clay sample under a cell pressure of 50 kN/m^2 . The sample failed at a deviator stress of 100 kN/m^2 . The cohesion of this clay sample would be
- (A) 25 kN/m^2
 - (B) 50 kN/m^2
 - (C) 75 kN/m^2
 - (D) 100 kN/m^2

64. When the movement of a wall under the earth pressures from the backfill was prevented, the coefficient of earth pressure was recorded as 0.50. The ratio of the coefficient of passive and active earth pressure of the backfill is
- 1/3
 - 3
 - 1/9
 - 9
65. In which one of the following failure zones is a logarithmic spiral shape of failure surface assumed in the case of bearing capacity analysis of $c - \phi$ soils ?
- active zone
 - passive zone
 - radial shearing zone
 - surcharge zone
66. Terzaghi's bearing capacity N_e , N_q and N_y are functions of
- cohesion only
 - angle of internal friction only
 - both cohesion and angle of internal friction
 - None of these
67. The observed N-value from a standard penetration test conducted in saturated sandy strata is 30, the N-value corrected for dilatancy may be taken as
- 15
 - 20
 - 23
 - 39
68. A pile group consists of 9 piles arranged in 3×3 square pattern. The efficiency of pile group calculated using Feld's rule will be
- 60%
 - 72%
 - 91%
 - 100%
69. The group efficiency of driven piles in sand at close spacing may be
- equal to 100%
 - greater than 100%
 - well below 100%
 - None of the above
70. Which of the following instruments is used for measurement of angles ?
- geodimeter
 - tellurometer
 - sextant
 - telescope

71. What is the slope correction for a length of 30 m along a gradient of 1 in 20 ?
- (A) 3.75 cm
 - (B) 0.375 cm
 - (C) 0.0375 cm
 - (D) 0.00375 cm
72. In a closed traverse with five sides, the error found from the fore bearing and back bearing of the last line is $+2^\circ$. The correction to the third line will be
- (A) $0^\circ 24'$
 - (B) $0^\circ 48'$
 - (C) $1^\circ 12'$
 - (D) $1^\circ 36'$
73. Which one of the following is carried out by two theodolite method ?
- (A) circular curve ranging
 - (B) tacheometric survey
 - (C) geodetic survey
 - (D) astronomical survey
74. The plotting of inaccessible points in a plane table survey can be done by the method of
- (A) interpolation
 - (B) radiation
 - (C) intersection
 - (D) traversing
75. The type of transition curve which satisfies the requirements in Highway is
- (A) cubic parabola
 - (B) parabola
 - (C) spiral
 - (D) lemniscate
76. If super elevation is not provided on a horizontal curve of a highway, then on which portion of the road are pot holes likely to develop ?
- (A) outer edge of road
 - (B) inner edge of road
 - (C) centre of road
 - (D) shoulder of road
77. As per latest IRC guidelines for design of flexible pavement of CBR method, the load parameter required is
- (A) number of commercial vehicles per day
 - (B) cumulative standard axles in msa
 - (C) equivalent single axle load
 - (D) number of vehicles (all types) during design life

78. Which one of the following sets of factors is related to design of thickness of rigid pavement by Westergaard method ?
- (A) CBR value and stiffness index of soil
 - (B) Deflection factor and traffic index
 - (C) Swelling index and bulk modulus
 - (D) radius of relative stiffness and modulus of subgrade reaction
79. Which one of the following causes ravelling in bituminous pavement ?
- (A) low bitumen content
 - (B) use of soft bitumen
 - (C) use of open-graded aggregates
 - (D) excessive bitumen content
80. Which of the following signals is provided beyond the trailing points and switches in a railway yard ?
- (A) repeater signal
 - (B) departure signal
 - (C) advance starter
 - (D) routing signal
81. The distance between the running faces of the stock-rail and gauge face of tongue rail measured at the heel of the switch is known as
- (A) flange way clearance
 - (B) throw of the switch
 - (C) heel divergence
 - (D) flare
82. The type of structure built or naturally evolved parallel to the shoreline and designed to protect harbours from waves is known as
- (A) Sea wall
 - (B) Groin
 - (C) Jetties
 - (D) Breakwaters
83. The percentage of time in a year during which the cross wind component remains within the limit, is
- (A) wind coverage
 - (B) head wind
 - (C) prevailing wind
 - (D) cross wind
84. 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) Prevailing wind

85. At what standard temperature, the specific gravity of water is equal to 1
- (A) 2 °C
(B) 4 °C
(C) 10 °C
(D) 20 °C
86. The ratios of pressures between the points A and B located at depths 0.5 m and 2 m respectively below a constant level of water in a tank is given by
- (A) 1 : $\sqrt{2}$
(B) 1 : 2
(C) 1 : 4
(D) 1 : 16
87. A current meter is a device used for measuring
- (A) current
(B) pressure
(C) viscosity
(D) velocity
88. 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 the above
89. 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 the above
90. A mercury water manometer has a gauge difference of 0.8 m. The difference in pressure measured in metres of water is equal to
- (A) 0.80
(B) 1.06
(C) 10.06
(D) 100.60
91. Which of the following conditions will be satisfied by steady irrotational flow ?
- (A) $\frac{\partial u}{\partial y} + \frac{\partial v}{\partial x} = 0$
(B) $\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} = 0$
(C) $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0$
(D) $\frac{\partial u}{\partial x} \times \frac{\partial v}{\partial y} = 0$
92. The stream function for a two dimensional flow is given by $\psi = 2xy$. The velocity at point (2, 2) shall be
- (A) $4\sqrt{2}$
(B) 4
(C) $2\sqrt{2}$
(D) $\sqrt{2}$

93. As the depth of immersion of a vertical plane surface increase the location of centre of pressure
- (A) comes closer to the centre of gravity of the area
 - (B) moves apart from the centre of gravity of the area
 - (C) ultimately consider with the centre of gravity of the area
 - (D) remains unaffected
94. The concept of boundary layer was first introduced by
- (A) Newton
 - (B) Prandtl
 - (C) Reynold
 - (D) Kutter
95. The separation of boundary layer takes place if
- (A) pressure gradient is negative
 - (B) pressure gradient is zero
 - (C) pressure gradient is positive
 - (D) None of the above
96. Drag force on a cylinder for turbulent flow compared to laminar flow is
- (A) less
 - (B) equal
 - (C) more
 - (D) None of the above
97. An airplane is cruising at a speed of 800 km/hour at an altitude where the air temperature is 0 °C. The flight Mach Number at this speed is nearly
- (A) 0.25
 - (B) 0.63
 - (C) 0.67
 - (D) 1.30
98. The loss of head in a pipe carrying turbulent flow varies
- (A) inversely as the square of the velocity of flow
 - (B) inversely as the square of the diameter of pipe
 - (C) directly as the square of the velocity of flow
 - (D) directly as the velocity of flow
99. The pressure at the summit of a syphon is
- (A) less than atmospheric
 - (B) equal to atmospheric
 - (C) more than atmospheric
 - (D) None of the above
100. The pipe which carries water under pressure from reservoir to turbine is called
- (A) Scroll case pipe
 - (B) Draft tube
 - (C) Pen stock
 - (D) None of the above