प्रवक्ता (तकनीकी शिक्षा विभाग) प्रतियोगी परीक्षा, 2020
परीक्षा दिनांक :– 15-3-2021 समय :– 2:00 PM-5:00 PM.

पुस्तिका में पृष्ठों की संख्या : 24
Number of Pages in Booklet : 24

पुस्तिका में प्रश्नों की संख्या : 150
No. of Questions in Booklet : 150

प्रश्न-पत्र पुस्तिका संख्या /
Question Paper Booklet No. 7419561

25/3/21

Paper Code : 06
Sub: CIVIL ENGG.

LTE-12

Paper - II

समय : 3.00 घण्टे
Time : 3.00 Hours

अधिकतम अंक : 75
Maximum Marks : 75

प्रश्न-पत्र पुस्तिका एवं उत्तर पत्रक के पेपर सील/पॉलिथीन बैग को खोलने पर परीक्षार्थी यह सुनिश्चित कर लें कि उसके प्रश्न-पत्र पुस्तिका पर वही प्रश्न-पत्र पुस्तिका संख्या अंकित है जो उत्तर पत्रक पर अंकित है । इसमें कोई भिन्नता हो तो परीक्षार्थी वीक्षक से दूसरा प्रश्न-पत्र प्राप्त कर लें । ऐसा सुनिश्चित करने की जिम्मेदारी अभ्यर्थी की होगी ।

On opening the paper seal/polythene bag of the Question Paper Booklet the candidate should ensure that Question Paper Booklet No. of the Question Paper Booklet and Answer Sheet must be same. If there is any difference, candidate must obtain another Question Paper Booklet from Invigilator. Candidate himself shall be responsible for ensuring this.

परीक्षार्थियों के लिए निर्देश

1. **सभी** प्रश्नों के उत्तर दीजिए ।
2. **सभी** प्रश्नों के अंक समान हैं ।
3. प्रत्येक प्रश्न का केवल **एक** ही उत्तर दीजिए ।
4. एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा ।
5. प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं, जिन्हें क्रमशः 1, 2, 3, 4 अंकित किया गया है । अभ्यर्थी को सही उत्तर निर्दिष्ट करते हुए उनमें से केवल एक गोले अथवा बबल को उत्तर-पत्रक पर **नीले बॉल प्वाइंट पेन** से गहरा करना है ।
6. **OMR** उत्तर-पत्रक इस परीक्षा पुस्तिका के अन्दर रखा है । जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर-पत्रक निकाल कर ध्यान से केवल **नीले बॉल पॉइंट पेन** से विवरण भरें ।
7. **प्रत्येक गलत उत्तर के लिए प्रश्न अंक का 1/3 भाग काटा जायेगा ।** गलत उत्तर से तात्पर्य अशुद्ध उत्तर अथवा किसी भी प्रश्न के एक से अधिक उत्तर से है । किसी भी प्रश्न से संबंधित गोले या बबल को खाली छोड़ना गलत उत्तर नहीं माना जायेगा ।
8. मोबाइल फोन अथवा इलेक्ट्रोनिक यंत्र का परीक्षा हॉल में प्रयोग पूर्णतया वर्जित है । यदि किसी अभ्यर्थी के पास ऐसी कोई वर्जित सामग्री मिलती है तो उसके विरुद्ध आयोग द्वारा नियमानुसार कार्यवाही की जायेगी ।
9. कृपया अपना रोल नम्बर ओ.एम.आर. पत्रक पर सावधानीपूर्वक सही भरें । गलत अथवा अपूर्ण रोल नम्बर भरने पर **5 अंक** कुल प्राप्तांकों में से काटे जा सकते हैं ।

चेतावनी : अगर कोई अभ्यर्थी नकल करते पकड़ा जाता है या उसके पास से कोई अनधिकृत सामग्री पाई जाती है, तो उस अभ्यर्थी के विरुद्ध पुलिस में प्राथमिकी दर्ज कराते हुए विविध नियमों-प्रावधानों के तहत कार्यवाही की जाएगी । साथ ही विभाग ऐसे अभ्यर्थी को भविष्य में होने वाली विभाग की समस्त परीक्षाओं से विवर्जित कर सकता है ।

INSTRUCTIONS FOR CANDIDATES

1. Answer **all** questions.
2. **All** questions carry equal marks.
3. Only **one** answer is to be given for each question.
4. If more than one answers are marked, it would be treated as wrong answer.
5. Each question has four alternative responses marked serially as **1, 2, 3, 4**. You have to darken only one circle or bubble indicating the correct answer on the Answer Sheet using **BLUE BALL POINT PEN**.
6. The **OMR** Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars carefully with **blue ball point pen** only.
7. **1/3 part of the mark(s) of each question will be deducted for each wrong answer.** A wrong answer means an incorrect answer or more than one answers for any question. Leaving all the relevant circles or bubbles of any question blank will not be considered as wrong answer.
8. Mobile Phone or any other electronic gadget in the examination hall is strictly prohibited. A candidate found with any of such objectionable material with him/her will be strictly dealt as per rules.
9. Please correctly fill your Roll Number in O.M.R. Sheet. **5 Marks** can be deducted for filling wrong or incomplete Roll Number.

Warning : If a candidate is found copying or if any unauthorized material is found in his/her possession, F.I.R. would be lodged against him/her in the Police Station and he/she would liable to be prosecuted. Department may also debar him/her permanently from all future examinations.

इस परीक्षा पुस्तिका को तब तक न खोलें जब तक कहा न जाए ।
Do not open this Test Booklet until you are asked to do so.

06-□

1. It is required to determine Reduced Level (RL) of ceiling of a room using a levelling instrument. The RL of the benchmark is 148.20 m. The reading with staff on the benchmark is 1.080 m. The reading with staff below the ceiling and held inverted is 2.150 m. The RL of the ceiling will be

(1) 151.43 m

(2) 149.27 m

(3) 147.13 m

(4) 148.21 m

2. How many missing quantities of a closed traverse can be determined ?

(1) One

(2) Two

(3) Three

(4) Five

3. When the difference in elevation between two points is determined from a single setup by backsighting on one point and foresight on the other point and lengths of foresight and backsight are made equal then

(1) Only the error due to non-parallelism of line of collimation and axis of bubble tube when bubble is central, is eliminated.

(2) Only errors due to curvature and refraction are eliminated.

(3) Errors due to non-parallelism of line of collimation and axis of bubble tube when bubble is central and errors due to curvature and refraction are eliminated.

(4) No errors are eliminated.

4. Which of the following statements is not correct with respect to the sensitivity of level tube ?

(1) Larger the radius of curvature of the internal surface, greater is the sensitivity.

(2) Larger the diameter of level tube, greater is the sensitivity.

(3) Larger the length of vapour bubble, greater is the sensitivity.

(4) Larger the viscosity of the liquid, greater is the sensitivity.

5. The index frame or Vernier frame is

(1) the A-frame attached to the telescope.

(2) the Vernier circle of the horizontal circle.

(3) the T-shaped frame carrying the Vernier of the vertical circle.

(4) the base of the theodolite having the leveling head.

6. Which of the following instruments is used for measuring both horizontal and vertical distances in a highly undulating ground where chaining is impossible ?

(1) Tape

(2) Line ranger

(3) Subtense bar

(4) Clinometer

7. Which of the following errors cannot be eliminated by taking both face observations from a transit theodolite ?

(1) Error when line of collimation is not perpendicular to the horizontal axis.

(2) Error when image formed by the objective does not fall in the plane of the diaphragm.

(3) Error when horizontal axis is not perpendicular to the vertical axis.

(4) Error when line of collimation is not parallel to the axis of the altitude level.

8. If the fore bearing of a line AB in a traverse is 10° 30' and fore bearing of line BC in the traverse is 130° then the included angle B will be

(1) 140° 30'

(2) 119° 30'

(3) 60° 30'

(4) 240° 30'

9. The Bowditch method of adjusting a traverse is based on the assumption that

(1) $e_1 \alpha \frac{1}{\sqrt{l}}$ and $e_2 \alpha \sqrt{l}$

(2) $e_1 \alpha \frac{1}{\sqrt{l}}$ and $e_2 \alpha \frac{1}{\sqrt{l}}$

(3) $e_1 \alpha \sqrt{l}$ and $e_2 \alpha \sqrt{l}$

(4) $e_1 \alpha \sqrt{l}$ and $e_2 \alpha \frac{1}{\sqrt{l}}$

Where e_1 and e_2 are errors in linear and angular measurements respectively and l is the length of a line.

10. If a horizontal distance measured during surveying is L, radius of Earth is R, mean equivalent of base line above mean sea level is h then the equivalent length at mean sea level will be

(1) $\frac{Lh}{R}$

(2) L

(3) $L + \frac{Lh}{R}$

(4) $L - \frac{Lh}{R}$

11. The contour lines for a valley form which of the following shapes ?

(1) Nearly O shaped

(2) Nearly V shaped

(3) Nearly U shaped

(4) Parallel to each other

12. What will be the declination if the magnetic meridian is to the right side of true meridian ?

(1) Eastern

(2) Western

(3) Northern

(4) Southern

13. If the sum of latitudes and sum of departures for a closed traverse are ΣL and ΣD respectively, the closing error will be

(1) $\Sigma L - \Sigma D$

(2) $\Sigma L + \Sigma D$

(3) $\sqrt{(\Sigma L)^2 + (\Sigma D)^2}$

(4) $\frac{\Sigma L}{\Sigma D}$

14. Which of the following corrections will always be subtractive ?

(1) Correction for slope

(2) Correction for length

(3) Correction for pull

(4) Correction for temperature

15. Which of the following methods of plane table surveying is used to locate the position of an inaccessible point ?

(1) Intersection

(2) Radiation

(3) Resection

(4) Traversing

16. In an optical square, the two mirrors are placed at an angle of

(1) 30°

(2) 45°

(3) 60°

(4) 90°

17. Cross staff is an instrument used for

(1) Levelling operation

(2) Measuring distances

(3) Measuring angles

(4) Setting out right angle

18. Which of the following pairs regarding explanations and the terminologies pertaining to masonry are correctly matched ?

A. Throating – Groove provided on the underside of projecting elements like chajja

B. Reveal – Projecting stone to serve as support for joist

C. Freeze – Vertical sides of finished openings for doors and windows

D. Gable – Triangle shaped masonry work provided at the ends of sloped roof.

Select the correct answer using the codes given below :

Codes :

(1) A and B

(2) B and C

(3) C and D

(4) A and D

19. Frog is provided in

(A) 9 cm high bricks only

(B) 4 cm high bricks only

(C) extruded bricks only

Of the above

(1) Only (A) is correct

(2) Only (B) is correct

(3) (A) and (C) are correct

(4) (A), (B) and (C) are correct

20. List – I contains the components of paints and List – II contains functions performed by them.

List – I	List – II
P. Base pigment	A. Accelerates the process of drying
Q. Vehicle	B. Facilitates the spread of paint.
R. Solvent	C. Provides the colour
S. Pigment	D. Gives durability and protection to painted surface
	E. Adjusts the viscosity of paint.

Match List – I with List – II and select the correct option.

	P	Q	R	S
(1)	B	D	A	C
(2)	D	C	B	E
(3)	B	E	D	C
(4)	D	B	E	C

21. The minimum percentage elongation for a steel reinforcement bar of grade Fe 415, as per Indian Standard, is

(1) 20%

(2) 18%

(3) 16%

(4) 14.5%

22. While comparing English bond and Flemish bond, following statements have been made :

A. Appearance of English bond is more attractive than Flemish bond.

B. Flemish bond is more economical compared to English bond.

C. 1½ bricks thick wall constructed in Flemish bond has more strength compared to 1½ bricks thick wall constructed with English bond.

Which of the above statements are not correct ?

(1) only A is correct.

(2) B and C are correct.

(3) A and C are correct.

(4) only B is correct.

23. Sill refers to a level/member at which of the following levels :

(1) Plinth level

(2) Lower level of window

(3) Lower level of roof

(4) Lower level of lintel

24. Which of the given joints is recommended by Indian Standard for frames of wooden doors and windows ?

(1) Bolted joint

(2) Butt joint

(3) Dovetail joint

(4) Lap joint

25. Which of the following is not matched correctly ?

(Material property)	(Definition)
(1) Ductility	– a measure of the degree of plastic deformation
(2) Stiffness	– a property of material to resist plastic deformation
(3) Malleability	– Material can be flattened into sheets
(4) Flexibility	– a property of material which permit considerable bending

26. An Assertion and Reason statement are given below :

A : Assertion statement : Direction of natural bed of stone shall be nearly perpendicular to the direction of load.

B : Reason statement : The stone has maximum strength in direction perpendicular to the natural bed as it can be split along this direction.

With reference to the above statement choose the correct option :

(1) A is true but B is false.

(2) A is false but B is true.

(3) A is true and B is correct reason of A.

(4) Both A and B are false

27. Consider the following statements with regards to fly ash to be used for making concrete :

A. The carbon content should be as high as possible.

B. The silica in fly ash should be in finely divided state.

C. The fineness of fly ash should be as high as possible.

Of the above statements :

(1) only A is correct.

(2) A and B are correct.

(3) A, B and C are correct.

(4) B and C are correct.

28. Which one of the following statements is the correct description of the structure of fibre board ?

(1) The slices of superior quality of wood are glued and pressed on the surface of interior wood.

(2) Thin and narrow wood shavings are soaked in a refractory binder material and pressed hard.

(3) Steamed mass of wood dusts, wood wool and other vegetable fibres are pressed hard to a thickness varying from 3 mm to 12 mm.

(4) Wood veneer backed by fabric mat

29. Impact test of aggregates is a measure of which property of aggregates ?

(1) Hardness
(2) Strength
(3) Soundness
(4) Toughness

30. As per Indian Standard, in Los Angeles abrasion test of aggregates, after the completion of test, the material is removed from machine and sieved on which size of Indian Standard sieve

(1) 1.7 mm
(2) 2.36 mm
(3) 4.75 mm
(4) 10 mm

31. The radial splits which are wider on the outside of the log and narrower towards the pith are known as

(1) Cup shakes
(2) Heart shakes
(3) Star shakes
(4) Rind galls

32. The reflection or appearance on the surface of plaster of the pattern of joints or similar patterns in the background, is called

(1) Grinning
(2) Crazing
(3) Hacking
(4) Laitance

33. Which of the following metals is not ductile ?

(1) Cast iron
(2) Wrought iron
(3) Aluminium
(4) Mild steel

34. Bulking is a term associated with which of the following building materials ?

(1) Cement
(2) Coarse aggregate
(3) Fine aggregate
(4) Concrete

35. Which of the following windows project from the walls to provide increased area of opening ?

(1) Bay window
(2) Louvered window
(3) Sliding window
(4) Casement window

36. Which of the following materials is not likely to be used for construction of pitched roofs ?

(1) Wood
(2) Steel
(3) Stone
(4) None of these

37. Highest specific yield from an aquifer will be from

(1) Water bearing formation of clay

(2) Water bearing formation of coarse gravel

(3) Both formations of clay and coarse gravel will have equal specific yield.

(4) As formation of coarse gravel will have more pores these will not hold any water.

38. If the ground water table is higher than the bed level of the canal, which of the following linings is usually provided ?

(1) Sprayed-in-place asphaltic membrane lining

(2) Stabilised soil lining

(3) Porous lining

(4) Boulder lining

39. Which of the following conditions is not true for a regime channel defined by Lacey ?

(1) The channel is flowing in limited coherent alluvium of the same character as that transmitted.

(2) Silt grade is constant.

(3) Silt charge is constant.

(4) Discharge is constant.

40. A concrete of 1 : 1½ : 3 mix is to be prepared by volumetric batching. Which of the following shall not be measured by volume ?

(1) Sand

(2) Coarse aggregate

(3) Cement

(4) None of these

41. Mean precipitation over an area is best obtained from gauged amount by

(1) Thiessen polygon method

(2) Arithmetic mean method

(3) Linearly interpolated isohyetal method

(4) Orographically weighted isohyetal method

42. Duty for various methods of irrigation are

A. Perennial irrigation has high duty

B. Flow irrigation has low duty

C. Lift irrigation has low duty

D. Tank irrigation has high duty

E. Inundation irrigation has high duty

Which of these statements are correct ?

(1) A to E

(2) A, B and C

(3) A, B and E

(4) B and D

43. Duty is maximum at which point of the following parts of a canal system ?

(1) Duty at the head of a water course

(2) Duty at the head of a minor

(3) Duty at the head of a branch canal

(4) Duty at the head of a main canal

44. Which of the following methods is not used for estimation of evaporation from water bodies ?

(1) Water budget method

(2) Energy balance method

(3) Mass transfer method

(4) Mass curve method

45. For a given silt charge and silt grade, as per Lacey's theory, the cross-section of regime channel for finer silt shall be

(1) Narrow and deep

(2) Wide and deep

(3) Wide and shallow

(4) Narrow and shallow

46. Which structure is constructed for irrigation through diversion scheme ?

(1) Storage reservoir

(2) Dam

(3) Bund

(4) Barrage

47. The correct order of relationship of field capacity, temporary wilting point and saturation capacity is

(1) Saturation capacity > Temporary wilting point > Field capacity

(2) Saturation capacity > Field capacity > Temporary wilting point

(3) Field capacity > Saturation capacity > Temporary wilting point

(4) Field capacity > Temporary wilting point > Saturation capacity

48. Silt content in which of the following channels increase as the flow progresses from section to section :

(1) Non-alluvial channels

(2) Alluvial channels

(3) Lined channels

(4) All of these

49. Which type of rain gauge has been adopted as the standard recording type rain gauge in India as per Indian standard ?

(1) Telemetering type

(2) Tipping bucket type

(3) Weighing bucket type

(4) Natural syphon type

50. Irrigation from wells is an example of

(1) Direct irrigation

(2) Storage irrigation

(3) Inundation irrigation

(4) Lift irrigation

51. Which method has been permitted in the Indian Standard IS 7112 for design of unlined channels ?

(1) Tractive force method

(2) Kennedy's method

(3) Lacey's method

(4) Sampler method

52. A hyetograph is a plot of

(1) depth of rainfall versus time

(2) intensity of rainfall versus time

(3) cumulative rainfall versus time

(4) average rainfall versus time

53. Which method is widely used in India for computation of consumptive use of water ?

(1) Penman's equation

(2) Ballaney Criddle equation

(3) Christiansen equation

(4) Hergreaves class A pan evaporation value

54. The ratio of the quantity of water stored in the root zone of the crops to the quantity of water actually delivered in the field is known as

(1) Water application efficiency

(2) Water use efficiency

(3) Water conveyance efficiency

(4) None of these

55. The spacing of tile drains to relieve waterlogged land is directly proportional to the

(1) depth of drain below the water level

(2) depth of drain below the ground surface

(3) coefficient of permeability of the soil to be drained

(4) depth of impervious strata from the drain

56. If a series of unit hydrographs of t duration are added together by lagging each hydrograph by t hours with respect to the previous unit hydrograph, we get

(1) Synthetic unit hydrograph

(2) S-hydrograph

(3) Storm hydrograph

(4) Mass flow curve

57. Origin and destination study is to be carried out at a large intersection. Which of the following methods shall be preferred for such a case ?

(1) Road side interview method

(2) Work spot interview method

(3) Tag on car method

(4) License plate method

58. The Equivalent Single Wheel Load (ESWL) of a dual wheel assembly carrying load of 2044 kg for each wheel, pavement thickness 520 mm, centre to centre spacing between two tyres 250 mm, clear gap between walls of two tyres 100 mm, is calculated to be as

(1) 2044 kg

(2) between 2044 kg and 4088 kg

(3) 4088 kg

(4) greater than 4088 kg

59. Potential evapo-transpiration primarily

(1) Depend on characteristics of soil

(2) Depend on characteristics of vegetation

(3) Depend on climatological factors

(4) Depend on canal efficiency

60. If the California Bearing Ratio (CBR) value of subgrade soil of a flexible pavement is 2.5%, the resilient modulus of subgrade soil is calculated as per Indian Roads Congress as

(1) 5 MPa

(2) 25 MPa

(3) 31.64 MPa

(4) 44 MPa

61. Which of the following statements is not true for mixed seal surfacing ?

(1) Premix is prepared using close graded aggregates.

(2) Adequate bitumen binder content is used in premix.

(3) Seal coat is required to be applied over it to get a non-porous surface.

(4) It may be laid over an existing bituminous surface to form a thin resurfacing layer.

62. The design of horizontal transition curve length for highways should take into account

(1) two factors, namely, comfort and rate of change of super elevation.

(2) two factors, namely, the rate of change of super elevation and minimum length formula given by IRC.

(3) only one factor, namely, the rate of change of centrifugal acceleration.

(4) three factors, namely, allowable values of rate of change of centrifugal acceleration, and super elevation and the minimum length formula given by IRC.

63. The Passenger Car Unit (PCU) values suggested for vehicles of classes bus, two wheeler automobile and pedal cycle for urban roads are

(1) 2.2, 0.4 and 0.7 respectively for bus, two wheeler automobile and pedal cycle

(2) 2.2, 0.7 and 0.4 respectively for bus, two wheeler automobile and pedal cycle

(3) 2.2, 0.4 and 0.2 respectively for bus, two wheeler automobile and pedal cycle

(4) 2.2, 0.2 and 0.7 respectively for bus, two wheeler automobile and pedal cycle

64. Which of the following traffic manoeuvres create maximum hazard to the traffic moving in the straight path ?

(1) Merging from the right

(2) Diverging on the left

(3) Merging from the left

(4) All of these cause equal conflict and hence cause equal hazard

65. Which of the following factors is not considered for the design of pavements ?

(1) Climatic factors

(2) Subgrade soil

(3) Lane width

(4) Environmental factors

66. Psychological widening on road curves is given by (symbols have the usual meaning)

(1) $\frac{0.1\ V}{\sqrt{R}} + \frac{nL^2}{2R}$

(2) $\frac{0.1\ nV}{\sqrt{R}}$

(3) $\frac{nL^2}{2R}$

(4) $\frac{0.1\ V}{\sqrt{R}}$

67. In the group index method of flexible pavement design, which one of the following factors decides the thickness of base and surface course ?

(1) type of surface and base course materials

(2) percentage of sub-grade soil passing 75 micron sieve

(3) daily volume of commercial vehicles

(4) percentage of liquid limit by subgrade soil

68. Which of the following is an engineering measure to decrease the accident rates ?

(1) Speed control

(2) Safety drive

(3) Traffic control devices

(4) Road lighting

69. In Marshall testing of bituminous mixes, as the bitumen content increases the flow value

(1) remain constant

(2) increases monotonically

(3) decreases first and then increases

(4) increases first and then decreases

70. As per IRC-67-2001; a traffic sign indicating the speed limit on a road should be of

(1) circular shape with white background and red border

(2) triangular shape with red background and white border

(3) triangular shape with white background and red border

(4) circular shape with red background and white border

71. Maximum number of vehicles can be parked with

(1) 30° parking

(2) 45° angle parking

(3) parallel parking

(4) 90° angle parking

72. Which one of the following causes ravelling in bituminous pavement ?

(1) excessive bitumen content

(2) use of soft bitumen

(3) low bitumen content

(4) use of open graded aggregates

73. Identify the traffic sign given below :

(1) No Parking
(2) No Standing
(3) No Entry
(4) Cross road ahead

74. Choose the correct list of factors influencing compaction of subgrade soil
(1) Optimum moisture content of soil, Stone content
(2) Type and amount of compaction, Type of soil, Type of highway
(3) Moisture content, Type of soil, Stone content
(4) Moisture content, Amount of compaction, Type of compaction, Type of soil, Stone content

75. Safe speed limit in a zone corresponds to
(1) From 15^{th} percentile of cumulative speed distribution curve
(2) From 85^{th} percentile of cumulative speed distribution curve
(3) From 98^{th} percentile of cumulative speed distribution curve
(4) From 30^{th} percentile of cumulative speed distribution curve

76. Vertical alignment of a two lane road is normally designed considering
(1) Ruling gradient
(2) Limiting gradient
(3) Exceptional gradient
(4) Minimum gradient

77. Maximum superelevation recommended by the IRC for urban road stretches with frequent intersections is
(1) 5.5%
(2) 10.0%
(3) 7.0%
(4) 4.0%

78. Which shape of camber is best suited for flexible pavements ?
(1) Straight line
(2) Parabolic
(3) Hyperbolic
(4) Combination of straight and hyperbolic

79. Commonly used method for strengthening of existing bituminous pavements is
(1) Asphalt concrete
(2) Built-up spray grout
(3) Sheet asphalt
(4) Mastic asphalt

80. The road classification system which categorized the roads into three classes – primary system, secondary system and tertiary system, was adopted in India in

(1) First 20 year road development plan (1943 – 1961)

(2) Second 20 year road development plan (1961 – 1981)

(3) Third 20 year road development plan (1981 – 2001)

(4) Fourth 20 year road development plan (2001 – 2021)

81. In the cross-section of a road, formation width is defined as

(1) width of carriageway including separators, if any

(2) width of shoulders

(3) width of carriageway excluding separators, if any

(4) width of carriageway including separators, if any plus width of shoulders

82. Which shape has been recommended by the IRC for transition curve ?

(1) Cubic parabola

(2) Leminscate

(3) Spiral

(4) Parabola

83. Which one of the following expressions gives intermediate sight distance as per I.R.C. standards ? (SSD : Stopping Sight Distance; OSD : Overtaking Sight Distance)

(1) SSD + OSD/2

(2) (OSD – SSD)/2

(3) 2SSD

(4) 2OSD

84. Reflection cracking is observed in

(1) Rigid pavement

(2) Bituminous overlay over cement concrete surface

(3) Flexible pavement

(4) Rigid overlay over flexible pavement

85. Tie bars in cement concrete pavements are at

(1) expansion joint

(2) warping joint

(3) contraction joint

(4) longitudinal joint

86. For the purpose of calculating headlight sight distance for a valley curve, the height of headlight above the road surface, as per Indian Roads Congress, is taken as

(1) 0.15 m

(2) 0.75 m

(3) 1.0 m

(4) 1.2 m

87. Settling column analysis is usually performed to determine removal efficiency of

(1) Compression suspension

(2) Discrete suspension

(3) Hindered suspension

(4) Flocculent suspension

88. The water supply to a house begins with the connection of the service pipe with the municipal water mains. The connection comprises :

A. Stop cock

B. Goose neck

C. Ferrule

D. Water meter

The correct sequence of these connections is :

(1) C, B, A, D

(2) A, B, C, D

(3) A, C, B, D

(4) C, B, D, A

89. Design hourly volume indicate

(1) Maximum hourly traffic volume

(2) Hourly volume that is exceeded 29 times in a year

(3) Hourly volume that is exceeded 9 times in a year

(4) Hourly volume that is exceeded 19 times in a year

90. If diameter (d) of a suspended particle in a water sample is doubled and is upto 0.1 mm, the settling velocity (v) of this particle in a sedimentation tank will become

(1) $2v$

(2) $4v$

(3) $\sqrt{2}v$

(4) $\frac{v}{\sqrt{2}}$

91. Which of the following methods of softening of water is used to obtain water of zero hardness ?

(1) Boiling the water

(2) Adding lime to water

(3) Lime soda process

(4) Ion-exchange process

92. Which of the following is not correct ?

(1) The pH of domestic sewage is slight alkaline and it tends to become acidic with passage of time.

(2) The pH of domestic sewage is slight alkaline and it may become highly alkaline due to mixing with industrial sewage.

(3) The pH of domestic sewage is slight alkaline and it may become highly acidic due to mixing with industrial sewage.

(4) The pH of domestic sewage is slight alkaline and it tends to become more alkaline with passage of time.

93. Ultimate first stage BOD of the sewage does not depend on temperature during the reaction. The statement is
(1) Always true
(2) Always false
(3) True if COD is large
(4) True if COD is small

94. Horizontal flow and aerated are common terms associated with
(1) Screens
(2) Grit chamber
(3) Comminutor
(4) Shredder

95. The capacity of an aeration tank for activated sludge process is calculated taking into consideration
(1) Aeration period
(2) Volume of flow of sewage
(3) Volume of returned activated sludge
(4) All of these

96. Hydrolysis, acid formation and methane formation are the stages of which of the following processes
(1) Disinfection of sludge
(2) Digestion of sludge
(3) Settling of sludge
(4) Removal of sludge

97. Imhoff cone is used to measure
(1) Suspended solids
(2) Dissolved solids
(3) Settleable solids
(4) Total solids

98. Orthotolidine test is conducted in water treatment to calculate
(1) Concentration of coagulant required
(2) Amount of chlorine in bleaching powder
(3) Amount of residual chlorine
(4) Colour

99. The suitable method for forecasting population for an old developed large city, is
(1) Geometric mean method
(2) Arithmetic mean method
(3) Logistic curve method
(4) Comparative graphical method

100. Air-binding in rapid sand filters is encountered when
(1) the water subjected to prolonged aeration.
(2) there is excessive negative head.
(3) the filter bed comprises largely of coarse sand.
(4) the raw water contains dissolved gases.

101. Which of the following is not true for a septic tank ?
(1) It is combined sedimentation and digestion tank.
(2) Anaerobic digestion takes place in a septic tank.
(3) It is designed for a detention period of 5 to 10 days.
(4) It is usually rectangular in shape.

102. Consider the following statements in a sewage treatment process :

A. Anaerobic decomposition is more energy consuming as compared to aerobic decomposition.

B. Detention time required for anaerobic decomposition is more as compared to that for aerobic decomposition.

C. Anaerobic decomposition is a more sensitive process as compared to aerobic decomposition.

Which of the above statement(s) is/are correct ?

(1) A, B and C

(2) only B

(3) only C

(4) B and C only

103. A slow sand filter is cleaned by

(1) Transmitting compressed air through the filter.

(2) Reversing the direction of flow of water through the filter.

(3) Lowering water level and removing the top layer of sand.

(4) Transmitting water with disinfectant through the filter.

104. The efficiency of a sedimentation tank does not depend upon

(1) depth of tank

(2) horizontal velocity of water

(3) length of tank

(4) detention time

105. Self purification process of stream polluted by waste water can be divided into 4 distinct zones. The value of dissolved oxygen is reduced to zero in which zone ?

(1) Zone of active decomposition

(2) Zone of degradation

(3) Clearer water zone

(4) Zone of recovery

106. For high rate anaerobic sludge digesters, the typical value of Hydraulic Retention Time (HRT) is

(1) 5 days

(2) 10 – 20 days

(3) 20 – 30 days

(4) 30 – 40 days

107. Parshall flume in a grit chamber can be used as

(1) A flow measurement and velocity control device.

(2) A flow measurement and energy dissipation device.

(3) A velocity control and energy dissipation device.

(4) A velocity control, flow measurement and energy dissipation device.

108. Water distribution systems in India are designed for a period of

(1) 15 years

(2) 20 years

(3) 30 years

(4) 50 years

109. Which of the following water borne disease is caused by bacteria ?
(1) Amebic dysentery
(2) Poliomyelitis
(3) Hepatitis A
(4) Cholera

110. In a water distribution system, Reflux, Butterfly and Globe are types of
(1) Hydrants
(2) Valves
(3) Meters
(4) Fittings

111. Secondary settling tank is a type of
(1) Physical treatment
(2) Chemical treatment
(3) Combination of physical and biological treatment
(4) Biological treatment

112. In the design of storm sewers, "time of concentration" is relevant to determine the
(1) time of travel
(2) velocity in the sewer
(3) rainfall intensity
(4) area of sewer

113. Shallow, deep and drop are types of
(1) Septic tanks
(2) Trickling filter
(3) Manholes
(4) Clean-outs

114. Dechlorination of water is achieved by adding
(1) Sodium sulphate
(2) Sodium bisulphate
(3) Sodium hexametaphosphate
(4) Sodium thiosulphate

115. The multiplying factor, as applied to obtain peak hourly demand, in relation to average daily demand (per hour of course), is
(1) 2.0
(2) 2.7
(3) 1.5
(4) 1.8

116. Modern turbidimeters working on the principle of 'scattering of light' are known as :
(1) Optimeter
(2) Spectrometer
(3) Tintometer
(4) Nephelometer

117. Uniformity coefficient of filter sand given by
(1) D_{50}/D_5
(2) D_{60}/D_5
(3) D_{50}/D_{10}
(4) D_{60}/D_{10}

118. The flow through a circular pipe, when fluid with viscosity μ_1 is flowing through the pipe, is laminar. Another fluid with viscosity μ_2 ($\mu_2 > \mu_1$) is then passed through the same pipe again with the same velocity. What would be the nature of this flow ?

(1) The flow will remain laminar

(2) The flow will become turbulent

(3) The flow will be transition flow

(4) The flow will depend on Reynold's Number

119. If the value of potential function for a fluid flow is given as $\phi = 6\,xy$, the corresponding value of stream function will be

(1) $3x^2 + C$

(2) $3y^2 + C$

(3) $3(x^2 - y^2) + C$

(4) $3(x^2 + y^2) + C$

where C is a constant.

120. Viscosity is not dependent on rate of angular deformation for which fluids ?

(1) Newtonian fluids

(2) Non-Newtonian fluids

(3) Ideal fluids

(4) None of these

121. A turbulent flow in a 20 cm diameter pipe has a friction factor f = 0.04 at a Reynold's number of 10^5. The thickness of the laminar sublayer is

(1) 32.8 mm

(2) 0.328 mm

(3) 328 mm

(4) 3.28 mm

122. A submerged body will be in stable equilibrium if

(1) The center of buoyancy B coincides with center of gravity G.

(2) The center of buoyancy B is below the center of gravity G.

(3) The center of buoyancy B is above the meta center M.

(4) The center of buoyancy B is above the center of gravity G.

123. The velocity along the center line of a nozzle of length L is given by

$$V = 3t\left(2 + \frac{x}{L}\right)$$

Where V is the velocity in m/s, t is time in seconds from the instant of commencement of flow, x is the distance from inlet to the nozzle. When t = 4 seconds, x = 0.5 m & L = 1 m, the convective acceleration is

(1) 360 m/s^2

(2) 30 m/s^2

(3) 12 m/s^2

(4) 7.5 m/s^2

124. The loss of head H_L in an orifice discharging under a head H is

(1) $H(1 - C_V)$

(2) $\sqrt{H}\,(C_V - 1)$

(3) $H\left(1 - C_V^2\right)$

(4) $\left(\frac{1}{C_V^2} - 1\right)H$

where C_V is coefficient of velocity.

125. Efficiency of the jet of water having velocity V striking a series of vertical plates moving with a velocity u is given by

(1) $\eta = \frac{2V\,(V - u)}{u^2}$

(2) $\eta = \frac{2u\,(V - u)}{V^2}$

(3) $\eta = \frac{1}{2}u(V - u)$

(4) $\eta = \frac{u^2}{V^2(V - u)}$

126. Which of the following conditions would entail a greater energy dissipation in turbulent flow ?

1. Lower viscosity
2. Large intensity of turbulence
3. Smaller Eddy size

Select the correct answer using the codes given below :

Codes :

(1) 1, 2 and 3

(2) 1 and 2

(3) 2 and 3

(4) 1 and 3

127. Kinetic energy correction factor for laminar and turbulent flows through a pipe is

(1) about 1.5 for laminar and about 2.0 for turbulent

(2) about 1.0 for laminar and about 2.0 for turbulent

(3) about 1.0 for laminar and about 1.5 for turbulent

(4) about 1.5 for laminar and about 1.0 for turbulent

128. A venturimeter is fitted at the center of a horizontal pipe of 20 m length and the venturi head is measured as 'h'. What will be the change in venturi head if the end of the pipe in the direction of flow is raised by 0.2 m to make the pipe inclined ?

(1) 'h' will remain same

(2) 'h' will increase by 0.2 m

(3) 'h' will fall by 0.2 m

(4) 'h' will increase by 0.1 m

129. For a sphere falling at terminal velocity in the Stoke's law range, the drag coefficient C_D is

(1) 64/Re

(2) 24 Re

(3) 24/Re

(4) $24\left(1 + \frac{3}{16}R_e\right)/R_e$

where R_e is Reynold's number of the flow.

130. If the center line of the pipe is above the hydraulic gradient line
(1) Such a condition is not possible
(2) Pressure head in pipe is above atmospheric
(3) Pressure head in pipe is less than atmospheric
(4) Pressure head in the pipe is equal to atmospheric

131. Navier-Stokes equations are useful for the analysis of
(1) Uniform flows
(2) Laminar flows
(3) Turbulent flows
(4) Viscous flows

132. Metacenter of a body floating in a liquid is below the center of gravity of the body. What will happen if a small tilt is given to this body ?
(1) The body gets back to the initial position.
(2) The body will make simple harmonic motion about the initial position.
(3) The body will be in neutral equilibrium
(4) The body will tilt further in the direction of the given tilt.

133. The ratio of discharge through an orifice to discharge through an external mouth piece of same diameter as the orifice is
(1) Equal to unity
(2) More than unity
(3) Less than unity
(4) Depends on the length of the mouth piece

134. The flow rate through a pipe can be determined by constricting the flow and measuring the decrease in pressure due to increase in velocity at the constriction site. Which of the given instruments is not based on this principle ?
(1) Orifice
(2) Nozzle
(3) Venturimeter
(4) Barometer

135. Which of the following statements for free vortex flow, is incorrect ?
(1) Fluid particles move in circles about a point.
(2) Flow is necessarily rotational.
(3) The only non-trivial velocity component is tangential.
(4) Tangential speed varies with radius.

136. The equation of linear momentum is applied to a control volume in a flow through a nozzle. It gave the resultant reaction force acting on the fluid in the control volume. The force required to keep the nozzle in position is
(1) equal to the resultant reaction force in magnitude and direction.
(2) equal to the resultant reaction force in magnitude but opposite in direction.
(3) equal to the resultant reaction force minus the head loss and in the same direction.
(4) equal to the resultant reaction force minus the head loss and in the opposite direction.

137. The range for co-efficient of discharge (C_d) for a venturimeter is

(1) 0.7 to 0.8

(2) 0.95 to 0.99

(3) 0.6 to 0.7

(4) 0.8 to 0.9

138. When two or more pipes are connected in parallel, which of the given statements is incorrect ?

(1) The friction equation must be satisfied for each pipe.

(2) There can be only one value of head at any point.

(3) Algebraic sum of the flow rates at any junction must be zero.

(4) Algebraic sum of the flux and the flow resistance must be zero in any closed hydraulic circuit.

139. A boundary is known as hydro dynamically smooth if

(1) $\frac{K}{\delta'} = 0.3$

(2) $\frac{K}{\delta'} > 0.3$

(3) $\frac{K}{\delta'} = 6.0$

(4) $\frac{K}{\delta'} < 0.25$

Where K = Average height of the irregularities from boundary.

δ' = thickness of laminar sub-layer

140. Minor losses in a pipe flow are those losses

(1) which can be neglected always

(2) which are insignificantly small

(3) caused by local disturbance due to pipe fitting

(4) caused by frictional resistance

141. The Euler's equation of motion is based on the assumption of

(1) frictionless fluid only

(2) frictionless, incompressible and steady flow

(3) frictionless and steady flow

(4) motion along a streamline, frictionless and steady flow

142. A ball of heavy metal of specific gravity S_1 is immersed in a fluid of specific gravity S_1. The ball will

(1) Sink to bottom

(2) Fully immerse with top surface at fluid surface

(3) Stand at the mid height of the fluid

(4) Float over the surface of the fluid

143. In a turbulent flow in a pipe, the friction factor f is 0.02. If the mean velocity of flow is V, the shear velocity is

(1) 0.25 V

(2) 0.5 V

(3) 0.025 V

(4) 0.05 V

144. Horizontal component of force of buoyancy is

(1) Zero

(2) Equal to force of buoyancy

(3) Can be equal to or more than force of buoyancy depending on if the body is completely submerged or partially submerged

(4) Half of force of buoyancy

145. Free surface of mercury in an open tube remain

(1) Curved upwards

(2) Curved downwards

(3) Horizontal

(4) Depends on diameter of the tube

146. Steady flow occurs in fluid flow when

(1) Flow characteristics at a point change steadily with time

(2) Flow characteristics remain same at all points.

(3) Flow characteristics at a point do not change with time.

(4) Only velocity remains same at all points.

147. Bernoulli's theorem is based on

(1) Principle of conservation of mass flow

(2) Principle of conservation of energy

(3) Principle of conservation of momentum

(4) Both the principle of conservation of energy and principle of conservation of mass flow

148. Match List – I with List – II and select the correct answer using the code given below the lists :

List – I	List – II
P. Correction for sag	A. Aerial photograph
Q. Overlap	B. Base line
R. Additive constant	C. Prismatic compass
S. Least count 30'	D. Tacheometer

	P	Q	R	S
(1)	B	A	D	C
(2)	D	A	B	C
(3)	B	A	C	D
(4)	B	D	C	A

149. One of the desired relations of a theodolite is that the axis of the altitude level must be parallel to the line of collimation. If this condition exists, which of the following statements is correct ?

(1) Vertical axis will be truly vertical when the bubble is in centre of its run.

(2) Line of sight will generate a vertical plane when telescope is rotated about the horizontal axis.

(3) Vertical angles will be free from index error due to lack of parallelism.

(4) Line of sight will generate a vertical plane when the telescope is plunged.

150. Which geometrical shape is formed in solving Three Point Problem by the Bessel's Solution Graphical ?

(1) Isosceles triangle

(2) Equilateral triangle

(3) Rectangle

(4) Quadrilateral

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