2014
CIVIL ENGINEERING

Time Allowed : 3 Hours]   **[Maximum Marks : 300**

Read the following instructions carefully before you begin to answer the questions.

IMPORTANT INSTRUCTIONS

1. This Booklet has a cover (this page) which should not be opened till the invigilator gives signal to open it at the commencement of the examination. As soon as the signal is received you should tear the right side of the booklet cover carefully to open the booklet. Then proceed to answer the questions.

2. This Question Booklet contains **200** questions. Prior to attempting to answer the candidates are requested to check whether all the questions are there in series without any omission and ensure there are no blank pages in the question booklet. In case any defect in the Question Paper is noticed it shall be reported to the Invigilator within first 10 minutes.

3. Answer **all** questions. **All** questions carry equal marks.

4. You must write your Register Number in the space provided on the top right side of this page. Do not write anything else on the Question Booklet.

5. An answer sheet will be supplied to you separately by the invigilator to mark the answers.

6. You will also encode your Register Number, Subject Code, Question Booklet Sl. No. etc. <u>with Blue or Black ink Ball point pen</u> in the space provided on the side 2 of the Answer Sheet. If you do not encode properly or fail to encode the above information, action will be taken as per commission's notification.

7. Each question comprises *four* responses (A), (B), (C) and (D). You are to select ONLY ONE correct response and mark in your Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each question. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.

8. In the Answer Sheet there are **four** circles Ⓐ , Ⓑ, Ⓒ and Ⓓ against each question. To answer the questions you are to mark with Blue or Black ink Ball point pen ONLY ONE circle of your choice for each question. Select one response for each question in the Question Booklet and mark in the Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong. *e.g.* If for any item, Ⓑ is the correct answer, you have to mark as follows :

<div align="center">

Ⓐ ● Ⓒ Ⓓ

</div>

9. You should not remove or tear off any sheet from this Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. <u>After the examination is concluded, you must hand over your Answer Sheet to the Invigilator. You are allowed to take the Question Booklet with you only after the Examination is over.</u>

10. The sheet before the last page of the Question Booklet can be used for Rough Work.

11. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.

12. In all matters and in cases of doubt, the English Version is final.

13. Do not tick-mark or mark the answers in the Question booklet.

1. A good building stone should not absorb water more than

   (A) 5%   (B) 10%

   (C) 15%   (D) 20%

2. The process of mixing clay water and other ingredients to make brick is known as

   (A) Kneading   (B) Moulding

   (C) Pugging   (D) Drying

3. Match List I with List II and select the correct answer using the codes given below the list :

   List I   List II

   (a) Granite   1. Ornamental work

   (b) Marble   2. Ballast

   (c) Chalk   3. Rough stone work

   (d) Laterite   4. Manufacture of cement

   Codes :

	(a)	(b)	(c)	(d)
(A)	3	1	2	4
(B)	2	3	1	4
(C)	2	1	4	3
(D)	1	4	2	3

4. Assertion (A) :   Pure lime takes a long time to develope adequate strength.

   Reason (R)   :   Pure lime has low harding characteristics.

   Select your answer according to the coding system given below

   (A) Both (A) and (R) are true and (R) is the correct explanation of (A)

   (B) Both (A) and (R) are true and (R) is not the correct explanation of (A)

   (C) (A) is true but (R) is false

   (D) (A) is false but (R) is true

5. The exposed edges of stones are bevelled for a depth of 2.5 cm in a

   (A) Ashlar rough tooled masonry   (B) Ashlar rock face masonry

   (C) Ashlar chamfered masonry   (D) Ashlar block in course

6. As the cement concrete is weak in ———————— steel reinforcement is placed in it and this is termed as reinforced cement concrete

   (A) Tension   (B) Compression

   (C) Shear   (D) Shrinkage

ACFCVE
[Turn over

7. R.C.C. can be made free from rusting and corrosion with proper

   (A) Cement grade   (B) Aggregate
   (C) Compaction   (D) Cover

8. The compressive strength of concrete ——————— in general with increase in water cement ratio (other things being the same)

   (A) increases   (B) does not changes
   (C) decreases   (D) gets multiplied

9. The process of reducing the moisture from timber is known as

   (A) boiling   (B) seasoning
   (C) curing   (D) setting

10. The placing of veneers normal to each other increases the ——————— strength of plywoods

    (A) Longitudinal and transverse   (B) Transverse
    (C) Longitudinal   (D) Compressive

11. Poly Vinyl chloride (PVC) is a product. Which of the following is not relevant to this?

    (A) Obtained from Vinyl chlorides and acetate
    (B) Resists attacks by acids and alkalis
    (C) Which is light weight and withstand wear and tear
    (D) It is fire resistance

12. The property of a material to resist the combined action of atmospheric and other factors is known as

    (A) Hardness   (B) Toughness
    (C) Durability   (D) Strength

13. This type of bond in brick work consist of alternate courses of headers and stretchers

    (A) English bond   (B) Flemish bond
    (C) Stretcher bond   (D) Header bond

14. This bond is considered to be the strongest bond in brickwork

    (A) Flemish bond   (B) Header bond
    (C) Stretcher bond   (D) English bond

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15. In this type of stone masonry, the beds, sides and face are finely chisel dressed and this gives a perfectly smooth appearance

    (A) Coursed rubble masonry
    (B) Ashlar masonry
    (C) Uncoursed rubble masonry
    (D) Random rubble masonry

16. Consider the statements :
    (I) Cost of construction of stone masonry is more than that of brick masonry
    (II) The mortar joints are thick in stone masonry than that of brick masonry
    (III) Stones resist fire better than bricks
    (IV) Stone work is stronger than brick work
    Of the above statement :
    (A) I and III are correct
    (B) IV alone is correct
    (C) I, II, IV are correct
    (D) All are correct

17. The usual concrete mix used for lintel is
    (A) 1:3:6
    (B) 1:2.5:5
    (C) 1:2:4
    (D) 1:1.5:3

18. Reinforced cement concrete is equally strong in taking
    (A) tensile and compressive stresses
    (B) tensile and shear stresses
    (C) compressive and shear stresses
    (D) tensile, compressive and shear stresses

19. An example of accelerator in cement concrete is
    (A) $CaCl_2$
    (B) $CaSO_4$
    (C) Na_2SO_4
    (D) $NaCl$

20. A cavity wall is constructed to resist
    (A) axial force
    (B) wind loads
    (C) heat flow
    (D) dampness

21. The curvature of the earth is taken into consideration if the area of survey is
    (A) $100 - 150$ km²
    (B) $50 - 100$ km²
    (C) $150 - 200$ km²
    (D) more than 200 km²

22. In order to determine the natural features and artificial features of a country, such as rivers, lakes, forests, hills, roads, railways, canals, towns and villages, the surveying preferred is
    (A) Topographical surveying
    (B) Reconnaissance surveying
    (C) Location surveying
    (D) City surveying

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23. The surveying done for obtaining maps to determine urban and rural details such as the boundaries of fields, houses and other property intended for taxation and revenue purposes, is called

(A) Geographical surveying   (B) Geodetic surveying

(C) Cadastral surveying   (D) Urban surveying

24. An invar tape is used for length measurements of very high accuracy, because it possesses a ―――――――― coefficient of thermal expansion

(A) Zero   (B) Very low

(C) Low   (D) High

25. If the distance measured between any two points on the ground is along a slope, only its ―――――――― is used in the preparation of a map

(A) vertical component   (B) horizontal component

(C) length along the slope   (D) both (B) and (C)

26. The error in measured length due to sag of chain or tape is known as

(A) Cumulative error, positive or negative

(B) Compensating error, positive

(C) Compensating error, positive or negative

(D) Cumulative error, positive

27. The longest chain line passing through the center of the area is called

(A) tie line   (B) diagonal line

(C) check line   (D) base line

28. In a whole circle bearing system, $S\ 25°\ 15'\ E$ corresponds to

(A) $115°\ 15'$ (B) $154°\ 45'$

(C) $205°\ 15'$ (D) $334°\ 45'$

29. If the fore bearing of a line is $N\ 26°\ 35'\ W$, its back bearing will be

(A) $S\ 26°\ 35'\ E$ (B) $S\ 26°\ 35'\ W$

(C) $N\ 26°\ 35'\ E$ (D) $N\ 53°\ 25'\ W$

30. In a level if the temperature increases, the sensitivity of a bubble tube

(A) increases   (B) decreases

(C) remain constant   (D) none of these

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31. The method of differential leveling is used in order to find the difference in elevation between two points when

(A) they are far apart

(B) the difference in elevation between the two stations is great

(C) both the stations are not inter-visible

(D) all of the above

32. Which of the following statement is not correct?

(A) The slope is steeper when the contours are close

(B) Contour lines of the same elevation cannot merge together or cross

(C) The slope is not uniform where the contours are equally spaced

(D) Contour lines of different elevation can merge only for a vertical cliff

33. The clinometer is an instrument used for measuring very accurately

(A) horizontal angles   (B) vertical angles

(C) horizontal and vertical angles   (D) linear measurements

34. In theodolite surveying the methods of repetition and reiteration are used to obtain horizontal angles to a degree ——————— what the instrument is capable of measuring

(A) lesser than   (B) finer than

(C) equal to   (D) not equal to

35. In theodolite traverse angles between the traverse lines are ——————— while in compass traverse the angles are deduced from the observed bearings

(A) observed directly   (B) observed indirectly

(C) not deduced   (D) none of the above

36. Which is an odd instrument with regard to levelling?

(A) Altimeter   (B) Clinometer

(C) Abney hand level   (D) Planimeter

37. Process of turning the telescope about the vertical axis in a horizontal plane is called

(A) reversing   (B) transiting

(C) plunging   (D) swinging

38. This method of surveying is extensively used in topographic mapping for filling details between stations fixed by triangulation of theodolite traverses

   (A) Theodolite surveying   (B) Triangulation

   (C) Plane table surveying   (D) Tacheometric surveying

39. The method of plane tabling used to locate the position of the instrument station on the drawing sheet with respect to other stations is known as

   (A) traversing   (B) intersection

   (C) resection   (D) radiation

40. In triangulation the station selected close to the main station for avoiding intervening obstruction is called

   (A) eccentric station   (B) pivot station

   (C) tie station   (D) satellite station

41. Match List I with List II and select the correct answer by using codes given below the lists :

   List I

   (a) Ratio of applied load and area of cross-section of the loaded section

   (b) Ratio of the change in length and original length of the loaded section

   (c) Radio of maximum load and original area of cross-section

   (d) Ratio of stress and strain

   List II

   1. Strain

   2. Ultimate stress

   3. Young's modulus of elasticity

   4. Unit stress

   Codes :

	(a)	(b)	(c)	(d)
(A)	4	1	2	3
(B)	1	2	3	4
(C)	4	3	2	1
(D)	1	3	2	4

42. Moment of inertia of a circular section of dia 'D' about the centroidal axis is

   (A) $\dfrac{\pi D^3}{64}$ (B) $\dfrac{\pi D^4}{64}$

   (C) $\dfrac{\pi D^3}{32}$ (D) $\dfrac{\pi D^4}{32}$

43. Consider the following statements :

Assertion (A) : For the same shear force, maximum shear stress developed in circular section is lesser than in the rectangular section

Reason (R) : Circular section is stronger in shear

Of these statements :

(A) (A) is true and (R) is false (B) (A) is false and (R) is true

(C) Both (A) and (R) are True (D) Both (A) and (R) are false

44. Which of the following statement is wrong?

(A) The deformation of the bar per unit length in the direction of the force is called linear strain

(B) The Poisson's ratio is the ratio of lateral strain to the linear strain

(C) The ratio of change in volume to the original volume is called volumetric strain

(D) The bulk modulus is the ratio of linear stress to the linear strain

45. When a body is subjected to a direct tensile stress (p) in one plane accompanied by a simple shear stress (q), the maximum normal stress is

(A) $\frac{p}{2} + \frac{1}{2}\sqrt{p^2 + 4q^2}$ (B) $\frac{p}{2} - \frac{1}{2}\sqrt{p^2 + 4q^2}$

(C) $\frac{p}{2} + \frac{1}{2}\sqrt{p^2 - 4q^2}$ (D) $\frac{p}{2} - \frac{1}{2}\sqrt{p^2 - 4q^2}$

46. Modulus of resilience is the

(A) Energy stored in a body when strained within elastic limits

(B) Energy stored per unit volume in a body when strained upto the breaking of the specimen

(C) Maximum strain energy per unit volume which can be stored in a body at ultimate stress

(D) None of the above

47. Which of the following statement is correct?

(A) A continuous beam has only two supports at the ends

(B) A uniformly distributed load spreads uniformly over the whole length of a beam

(C) The bending moment is maximum where shear force is maximum

(D) At the point of contraflexure, the bending moment is maximum

ACFCVE
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48. In a simple bending theory, one of the assumption is that the plane sections before bending remain plane after bending. This assumption means that
   (A) stress is uniform throughout the beam
   (B) strain is uniform throughout the beam
   (C) stress is proportional to the distance from the neutral axis
   (D) strain is proportional to the distance from the neutral axis

49. The polar moment of inertia of a solid circular shaft of diameter (d) is
   (A) $\dfrac{\pi d^3}{16}$
   (B) $\dfrac{\pi d^3}{32}$
   (C) $\dfrac{\pi d^4}{32}$
   (D) $\dfrac{\pi d^4}{64}$

50. Fatigue test is carried out for
   (A) Stresses varying between two limits of equal value, but of opposite sign
   (B) Stresses varying between two limits of unequal value, but of opposite sign
   (C) Stresses varying between two limits of unequal value, but of same sign
   (D) All of the above

51. The property of a material by which it can be beaten or rolled into plates is called
   (A) Malleability
   (B) Ductility
   (C) Plasticity
   (D) Elasticity

52. The phenomenon of slow extension of materials having constant load, i.e increasing with time is called
   (A) Creeping
   (B) Yielding
   (C) Breaking
   (D) None of these

53. When equal and opposite forces applied to a body, tend to elongate it, the stress so produced, is called
   (A) Shear stress
   (B) Compressive stress
   (C) Tensile stress
   (D) Transverse stress

54. A simply supported beam carries two equal concentrated loads W at distances L/3 from either support. The maximum bending moment M is
   (A) $\dfrac{WL}{3}$
   (B) $\dfrac{WL}{4}$
   (C) $\dfrac{5WL}{8}$
   (D) $\dfrac{3WL}{12}$

55. In a continuous bending moment curve the point where it changes sing, is called
   (A) Point of inflexion
   (B) Point of contraflexure
   (C) Point of virtual hinge
   (D) All the above

56. Shear force diagram for a cantilever carrying a uniformly distributed load over its whole length is

(A) Triangle
(B) Rectangle
(C) Parabola
(D) Cubic parabola

57. If a shaft is simultaneously subjected to a torque T and a bending moment M, the ratio of maximum bending stress and maximum shearing stress is

(A) $\dfrac{M}{T}$
(B) $\dfrac{T}{M}$
(C) $\dfrac{2M}{T}$
(D) $\dfrac{2T}{M}$

58. Strain energy of any member may be defined as work done on it

(A) to deform it
(B) to resist elongation
(C) to resist shortening
(D) all the above

59. Pick up the correct statement from the following :

(A) A ductile material has large plastic zone
(B) A brittle material has no plastic zone
(C) A rigid material has no plastic zone
(D) All the above

60. The value of Poisson's ratio always remains

(A) greater than one
(B) less than one
(C) equal to one
(D) none of these

61. Three moment equation is applicable only when

(A) The beam is prismatic
(B) There is no settlement of support
(C) The spans are equal
(D) None of the above

62. The carry over factor for a prismatic beam element whose far end is hinged is

(A) 0
(B) 2
(C) 0.5
(D) 2.5

63. The modified stiffness of a member which crosses the axis of symmetry is

(A) 6 EI/L
(B) 4 EI/L
(C) 3 EI/L
(D) 2 EI/L

64. For the usual loadings on the beam ——————— moments occurs at the mid-section of the spans

(A) Sagging
(B) Hogging
(C) Zero
(D) None of the above

65. The influence line for any stress function are used for obtaining the maximum value due to
    (A) Single point load only   (B) Uniformly live load only
    (C) Several point loads   (D) All the above

66. The variation of influence line for the stress function in a statically determinate structure is
    (A) Circular   (B) Parabolic
    (C) Linear   (D) None of the above

67. A member under tension is called
    (A) Strut   (B) Tie
    (C) Strut-tie   (D) Rafter

68. The number of unknowns to be determined in the stiffness method is equal to
    (A) Static indeterminacy
    (B) Kinematic indeterminacy
    (C) Static indeterminacy and kinematic indeterminacy
    (D) None of the above

69. The forces acting on the bar as shown in figure introduce
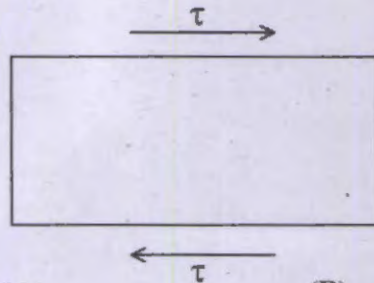
    (A) Compressive stress   (B) Tensile stress
    (C) Shear stress   (D) None of these

70. The ratio of maximum shear stress to average shear stress of a circular beam is
    (A) 2/3   (B) 3/2
    (C) 3/4   (D) 4/3

71. _____ theory is suitable for brittle material
    (A) Maximum strain energy theory   (B) Maximum shear stress theory
    (C) Maximum principal stress theory (D) Distortion energy theory

72. Which one of the following pairs is not correctly matched?
    (A) Lame's constant   :   Thick Cylinder
    (B) Macaulay's method   :   Deflection of beam
    (C) Euler's method   :   Theory of columns
    (D) Eddy's theorem   :   Torsion of shafts

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73. Bending moment 'M' and torque 'T' are applied on a solid circular shaft. If maximum bending stress equals to maximum shear stress developed, M is equal to

(A) T/2

(B) T

(C) 2T

(D) 4T

74. A solid shaft is subjected to a torque which produces maximum shear stress of 'τ_{max}'. If 'N' is the modulus of rigidity, the strain energy per unit volume of the shaft is equal to

(A) $\dfrac{\tau_{max}^2}{4N}$

(B) $\dfrac{\tau_{max}^2}{2N}$

(C) $\dfrac{2\tau_{max}^2}{N}$

(D) $\dfrac{4\tau_{max}^2}{N}$

75. A simply supported beam of constant EI is subjected to end couple of M at the left supports. What is the moment required at the right support to prevent the rotation at the right support?

(A) M/3

(B) M/2

(C) M

(D) 2M

76. Consider the following statements : Sinking of an intermediate support of a continuous beam

1. Reduces the negative moment at support
2. Increases the negative moment at support
3. Reduces the positive moment at the center of span
4. Increases the positive moment at the center of span

Of these statements :

(A) 1 and 4 are correct

(B) 1 and 3 are correct

(C) 2 and 3 are correct

(D) 2 and 4 are correct

77. Which of the following statement is correct?

(A) $F_m = A_{ms}{}^T F_s A_{ms}$

(B) $F_m = A_{ms} F_s A_{ms}{}^T$

(C) $F_s = A_{ms}{}^T F_m A_{ms}$

(D) $F_s = A_{ms} F_m A_{ms}{}^T$

78. A simply supported beam AB is subjected to a clockwise moment M at its ends. Let i_a and i_b be the slopes at A and B respectively then, $\dfrac{i_a}{i_b}$ is equal to

(A) 1/2

(B) 1

(C) 1/3

(D) 1/4

79. A simply supported beam AB, having span L is subjected to a displacement Δ at its mid point. Then the rotation at the ends will be

(A) $\Delta/2L$

(B) $2\Delta/3L$

(C) $3\Delta/L$

(D) $5\Delta/L$

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80. The stiffness of a structure indicate its capacity to

    (A)   Carry load without failure

    (B)   Resist load without significant deformation

    (C)   Carry load without tension

    (D)   None of the above

81. The liquid limit of a soil mass is 20% and its plastic limit is 25%. Then the plasticity index of this soil is

    (A)   5   (B) -5

    (C)   0   (D)   None of these

82. For engineering purposes, soil is defined as

    (A)   the loose mantle at the surface of the earth which favours the growth of plant

    (B)   a natural aggregate of mineral grains, loose or moderately cohesive, inorganic or organic in nature

    (C)   a disintegrated rock

    (D)   all of the above

83. Black cotton soil

    (A)   is organic in nature

    (B)   contains large percentage of clay minerals

    (C)   exhibits low compressibility

    (D)   all the above

84. Consolidation and compressibility of soil

    (A)   is a measure of the ability of soil to allow the water to pass through its pores

    (B)   is a measure of the ability of soil to bear stresses without failure

    (C)   deals with changes in volume of pores in a soil under load

    (D)   none of the above

85. The property of soil a which is of great importance in finding settlement of structures is

    (A)   Permeability   (B)   Consolidation

    (C)   Compressibility   (D)   Both (B) & (C)

86. The maximum size of the particles of clay is about

    (A)   0.0002 mm   (B)   0.002 mm

    (C)   0.02 mm   (D)   0.2 mm

94. The coefficient of compressibility ——————— with increase in pressure

 (A) decreases   (B) increases

 (C) doest not change   (D) none of the above

95. The shear strength of cohesionless soil

 (A) is proportional to the cohesion of the soil

 (B) is proportional to the tangent of the angle of internal friction

 (C) increases with the decrease in normal stress of soil

 (D) all of the above

96. A line showing the dry density as a function of water content for soil containing no air voids, is called

 (A) 100% saturation line   (B) Zero air void line

 (C) Either (A) or (B)   (D) Liquid limit line

97. The bearing capacity factors N_c, N_q and N_r are functions of

 (A) Cohesion of the soil   (B) Internal friction angle

 (C) Both (A) & (B)   (D) None of the above

98. When the water table is close to the ground surface, the bearing capacity of a soil is reduced to

 (A) One-Half   (B) One-Fourth

 (C) One-Third   (D) Two-Third

99. Which of the following statement is correct?

 (A) The settlement of a flexible footing on cohesionless soil is less in the center than at the edges

 (B) The settlement of a rigid footing on cohesionless soil is uniform throughout

 (C) The settlement of a rigid footing on cohesive soil is uniform throughout

 (D) All of the above

100. In under-reamed piles, the diameter of the under-reamed portions are normally ——————— times the diameter of the shaft

 (A) 1 to 1.5   (B) 1.5 to 2

 (C) 2 to 2.5   (D) 3 to 3.5

87. Silt is a
   (A) fine grained soil with little or no plasticity
   (B) clay with a high percentage of the clay mineral
   (C) soil composed of unaltered mineral grains
   (D) material deposited by a glacier

88. Bulk density of a soil is defined as the ratio of
   (A) Weight of solids to the weight of water
   (B) Unit weight of solids to the unit weight of water
   (C) Total weight of soil mass to the total volume of soil mass
   (D) Volume of solids to the weight of solids

89. The plastic limit exists in
   (A) Sandy soils   (B) Gravel soils
   (C) Silty soils   (D) Clays

90. Which of the following is practically more permeable?
   (A) Sand and silt mixture   (B) Clay
   (C) Silt   (D) Coarse sand

91. The quantity of seepage of water in a soil medium is
   (A) inversely proportional to the coefficient of permeability
   (B) directly proportional to the length of flow of water from upstream
   (C) directly proportional to the coefficient of permeability
   (D) inversely proportional to the head of water at upstream

92. The consolidation of soil is defined as the
   (A) process of compression by gradual reduction of pore space under steady load
   (B) process which gives gradual decrease of water content at constant load
   (C) change in volume of soil due to expulsion of pore water under an applied load
   (D) all of the above

93. The ultimate settlement of a soil
   (A) is directly proportional to the compression index
   (B) is directly proportional to the depth of the compressible soil
   (C) both (A) & (B)
   (D) increases with an increase in the initial void ratio

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ACFCVE
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101. Water may not contain much impurities if its source is

    (A)   reservoirs
    (B)   stream flowing in plains
    (C)   lakes in lower regions
    (D)   spring along hill slopes

102. The Bacteria which can survive with or without free oxygen is

    (A)   Aerobic Bacteria
    (B)   Anaerobic Bacteria
    (C)   Faculative Bacteria
    (D)   Coliform Bacteria

103. Which of the following water borne disease is not caused by bacterial infections

    (A)   Typhoid
    (B)   Cholera
    (C)   Gastroenteritis
    (D)   Bacillary dysentery

104. Which of the following pairs is not correctly matched?

	Type of filter	Rate of Filtration
(A)	Rapid sand filter	$5.0 \, m^3/m^2/hr$
(B)	Slow sand filter	0.1 to $0.4 m^3/m^2/hr$
(C)	Double media filter	7.5 to $10 m^3/m^2/hr$
(D)	Pressure filter	15 to $20 m^3/m^2/hr$

105. Coal based thermal power station pollute the atmosphere by adding

    (A) NO_x and SO_2
    (B) NO_x, SO_2 and spm
    (C) NO_x, SO_2, spm and CO
    (D) NO_x, spm and CO

106. Which of the following treatments reduce salainity of water?

    1.   Flocculation and sedimentation
    2.   Filtration
    3.   Reverse osmosis
    4.   Electrodyalsis

Select the correct answers using the codes given below :

    (A)   1 and 2
    (B)   3 and 4
    (C)   2 and 3
    (D)   1 and 4

107. The clearing 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 time through the filter
    (D)   scrapping off the top layers of sand and admitting water

108. Which of the following would contain water with maximum amount of turbidity?

    (A)   lakes
    (B)   oceans

    (C)   rivers
    (D)   wells

109. The sewage system originates from

    (A)   house sewers
    (B)   lateral sewers

    (C)   branch sewers
    (D)   outfall sewers

110. The sewer which transports the sewage to the point of treatment, is called

    (A)   house sewer
    (B)   outfall sewer

    (C)   branch sewer
    (D)   main sewer

111. The pH value of sewage is determined with the help of

    (A)   Imhoff cone
    (B)   Turbidimeter

    (C)   Potentiometer
    (D)   None of these

112. Imhoff cone is used to determine

    (A)   settlable solids
    (B)   suspended solids

    (C)   dissolved solids
    (D)   none of these

113. The standard BOD of water is taken for

    (A)   1 day
    (B)   2 days

    (C)   5 days
    (D)   10 days

114. The digested sludge from septic tanks is removed after a maximum period of

    (A)   3 years
    (B)   3.5 years

    (C)   4 years
    (D)   6 years

115. The normal settling time allowed in a primary settling tank is

    (A)   3 hours
    (B)   1 hour

    (C)   6 hours
    (D)   9 hours

116. The coagulant which is generally not used for treating the sewage, is

    (A)   alum
    (B)   ferric chloride

    (C)   ferric sulphate
    (D)   chlorinated coppers

117. The ratio of 5 day BOD to ultimate BOD is about

(A) $\dfrac{1}{3}$

(B) $\dfrac{2}{3}$

(C) $\dfrac{3}{4}$

(D) 1.0

118. Filtration of water is done to remove largely

(A) colour

(B) odour

(C) turbidity

(D) pathogenic bacteria

119. The chloride content of treated water for public supplies should not exceed

(A) 100 ppm

(B) 150 ppm

(C) 250 ppm

(D) 300 ppm

120. The minimum self cleaning velocity of sewage flowing through pipe line, is

(A) 2 m/sec

(B) 1 m/sec

(C) 0.5 m/sec

(D) 0.25 m/sec

121. If 'd' and 'n' are the effective depth and depth of neutral axis respectively of a singly-reinforced beam, the lever arm of the beam is

(A) d

(B) n

(C) $d + \dfrac{n}{3}$

(D) $d - \dfrac{n}{3}$

122. Pick up the incorrect statement from the following :

The intensity of horizontal shear stress at the elemental part of the beam section, is directly proportional to

(A) shear force

(B) area of the part

(C) distance of the C.G. of the area from its neutral axis

(D) moment of the cross-section of the beam about its neutral axis

123. Spacing of stirrups in a rectangular beam, is

(A) kept constant throughout the length

(B) decreased towards the centre of the beam

(C) increased at the ends

(D) increased at the centre of the beam

124. The stresses developed in concrete and steel in a reinforced concrete beam 25 cm wide and 70 cm deep to the centre of reinforcement are 62.5 kg/cm² and 250 kg/cm² respectively, if m = 15, the depth of its neutral axis is

   (A)   20 cm   (B)   25 cm
   (C)   30 cm   (D)   35 cm

125. The width of the flange of a L-beam, should be less than

   (A)   one-sixth of the effective span
   (B)   breadth of the rib + four times thickness of the slab
   (C)   breadth of the rib + half the clear distance between the ribs
   (D)   least of the above

126. As per I.S.456, the reinforcement in a column should not be less than,

   (A)   0.5% and not more than 5% of cross-sectional area of column
   (B)   0.6% and not more than 6% of cross-sectional area of column
   (C)   0.7% and not more than 7% of cross-sectional area of column
   (D)   0.8% and not more than 8% of cross-sectional area of column

127. The maximum ratio of span to depth of a slab, simply supported and spanning in two direction is

   (A)   25   (B)   30
   (C)   35   (D)   40

128. For a continuous floor slab supported on beams, the ratio of end span length and intermediate span length, is

   (A)   0.6   (B)   0.7
   (C)   0.8   (D)   0.9

129. A flat slab is supported

   (A)   on beams
   (B)   on columns
   (C)   on beams and columns
   (D)   on columns monolithically built with slab

130. In a combined footing for two columns carrying unequal loads, the maximum hogging bending moment will occur at,

   (A)   more loaded column   (B)   equidistance from either column
   (C)   point of the maximum shear force   (D)   point of zero shear force

131. Bottom bars under the columns are extended into the interior of the footing slab, to a distance greater than

(A)   42 diameter from the centre of the column

(B)   42 diameter from the inner edge of the column

(C)   42 diameter from the outer edge of the column

(D)   24 diameter from the centre of the column

132. In a prestressed beam carrying an external load 'W' with a tendon having an angle of inclination 'θ' and prestressed load 'P', the net downward load at the centre will be

(A) $W - 2P\cos\theta$ (B) $W - P\cos\theta$

(C) $W - P\sin\theta$ (D) $W - 2P\sin\theta$

133. As per IS 1343, total shrinkage for a pretensioned beam is

(A) 3.0×10^{-2} (B) 3.0×10^{-3}

(C) 3.0×10^{-4} (D) 3.0×10^{-5}

134. The channels are subjected to twisting, due to absence of symmetry with regard to the axis,

(A)   parallel to flanges   (B)   parallel to web

(C)   perpendicular to flanges   (D)   both (B) and (C)

135. If 'P' is the wind pressure in kg/cm^2, 'v' is the velocity in km/hour and 'K' is the constant of proportionally, then

(A) $P = \dfrac{k}{v^2}$ (B) $v = \dfrac{K}{p^2}$

(C) $P = Kv^2$ (D) $P = Kv$

136. The rivets which are heated and then driven in the field, are known as,

(A)   power driven shop rivets   (B)   power driven field rivets

(C)   hand driven rivets   (D)   cold driven rivets

137. Efficiency of a riveted joint is defined as the ratio of

(A)   least strength of a riveted joint to the strength of solid plate

(B)   greatest strength of a riveted joint to the strength of solid plate

(C)   least strength of a riveted plate to the greatest strength of the riveted joint

(D)   all the above

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[Turn over

138. Effective sectional area of a compression member is equal to

    (A)   gross sectional area   ÷   area of rivet holes
    (B)   gross sectional area   −   area of rivet holes
    (C)   gross sectional area   +   area of rivet holes
    (D)   gross sectional area   ×   area of rivet holes

139. When a large value of radius of gyration is not required

    (A)   channels are placed back to back   (B)   channel flanges are kept inward
    (C)   channel flanges are kept outward   (D)   none of the above

140. If 'M' is the moment due to a couple in a bearing plate whose width is 'b' and allowable bending stress is 'P', the thickness 't' of the bending plate of the column splice, is

    (A) $t = \sqrt{\dfrac{b \times P}{6M}}$ (B) $t = \sqrt{\dfrac{6M}{b \times P}}$

    (C) $t = \dfrac{6M}{bP}$ (D) $t = \sqrt{\dfrac{6M}{bP}}$

141. A super passage is a cross drainage work provided when bed of natural drain is

    (A)   at same level as canal bed   (B)   well above F.S.L. in canal
    (C)   below FSL of canal   (D)   below bed level of canal

142. Permanent witting point is

    (A)   a characteristic of a plant
    (B)   a soil characteristic
    (C)   a soil characteristic modified by crop
    (D)   dependent on soil water plant fertilizer interaction

143. Paleo is the

    (A)   first watering before a crop is sown   (B)   first watering after a crop is sown
    (C)   last watering   (D)   none of the above

144. Base period of a crop is

    (A)   the same as crop period   (B)   less than crop period
    (C)   more than crop period   (D)   none of the above

145. The flow mass curve is an integral cumec of

    (A)   hydrograph   (B)   hyetograph
    (C)   flow duration curve   (D)   S-curve

146. The method used for estimating missing rainfall data is
    (A) normal ratio method
    (B) station year method
    (C) plotting positive method
    (D) national method

147. Base flow seperation is used in connection with
    (A) seepage flow
    (B) infiltration
    (C) evaporation
    (D) stream flow

148. Flow duration curve is a plot of
    (A) stream discharge against percentage of time the flow is equalled or exceeded
    (B) stream discharge against time in chronological order
    (C) accumulated stream flow against time
    (D) base flow against percentage of time the flow is exceeded

149. Hydrograph is a relation between time in hours and :
    (A) rainfall (mm)
    (B) predation (cm)
    (C) surface river off (cumecs)
    (D) evaporation (cm)

150. Double mass analysis is adopted to
    (A) estimate missing rainfall data
    (B) obtain intensities of rainfall at various durations
    (C) check consistency of data
    (D) cases where back-water effect is present

151. Hyetograph is a plot of
    (A) cumulative rainfall Vs time
    (B) rainfall depth Vs duration
    (C) evaporation rate Vs time
    (D) rainfall intensity Vs time

152. A stream receiving contribution from ground water is called
    (A) influent stream
    (B) effluent stream
    (C) ephenseral stream
    (D) basal

153. The mass curve of rainfall of a storm is plot of
    (A) rainfall depths for various equal durations plotted in decreasing order
    (B) rainfall depths for various equal durations plotted in increasing order
    (C) rainfall intensity Vs time in chronological order
    (D) accumulated precipitation Vs time in chronological order

154. In a level crossing type of cross drainage works
    (A) canal is above drain
    (B) canal is below drain
    (C) canal and drain are at the same level
    (D) none of the above

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[Turn over

155. The characteristic feature of a barrage is
   (A) provision of raised crest
   (B) creation of storage reservoir on U/S
   (C) provision of a series of gates across the river for flow regulation
   (D) a crest that is built in delta areas only

156. Fish ladder is provided on the side of
   (A) divide wall   (B) diaphragm wall
   (C) core wall   (D) wing wall

157. The main function of diversion head works provided at the off take of a canal from a river is
   (A) to raise water level in river   (B) to control floods
   (C) store water   (D) control silt entry into canal

158. A barrage differs from a weir on account of
   (A) low set crest   (B) effective control over river flow
   (C) series of gates to effect pondage   (D) all of the above

159. Maximum water application efficiency is in
   (A) surface irrigation   (B) lift irrigation
   (C) sprinkler irrigation   (D) furrow irrigation

160. The highest water saving method of irrigation is
   (A) sprinkler   (B) drip
   (C) sub-surface   (D) basin

161. The provision given on the periphery of twon in the limitation of its sizes in
   (A) housing   (B) green belt
   (C) zoning   (D) road system

162. The area characterized by substandard housing conditions within a city
   (A) twon   (B) division
   (C) slums   (D) subdivisions

163. When a town reaches a certain size, some sort of development is bound to take place is known as
   (A) ribbon development   (B) concentric spread
   (C) satellite growth   (D) scattered growth

164. Most of the towns in the past have grown in a way of
   (A) planned growth   (B) natural growth
   (C) satellite growth   (D) scattered growth

165. The road which connects the town to a state highway or a national highway is termed as

(A) local roads
(B) streets
(C) pathways
(D) arterial roads

166. To maintain easy flow of traffic or through roads and to give a convenience and comfort to the users of such roads, in

(A) Arterial roads
(B) Through roads
(C) By-pass roads
(D) Loo-roads

167. A way is to divert from the town all the through traffic which has no business in the town is

(A) express way
(B) outer ring road
(C) inner ring road
(D) free ways

168. The provision to indicate an arterial road on which fast urban traffic is allowed to move speedily and safely

(A) express way
(B) outer ring road
(C) inner ring road
(D) free ways

169. Slope provided across the road is called

(A) camber
(B) gradient
(C) super elevation
(D) none of the above

170. The Indian road congress was established in

(A) 1934
(B) 1952
(C) 1947
(D) 1961

171. The rate of rise or fall of a road along its alignment is known as

(A) gradient
(B) camber
(C) side slope
(D) super elevation

172. Width of traffic lane of a single lane is

(A) 3.75 m
(B) 5.50 m
(C) 7.00 m
(D) 7.50 m

173. All the sections of the road should be designed for

(A) overtaking sight distance
(B) intermediate sight distance
(C) (A) and (B)
(D) stopping sight distance

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174. The layer that is directly in contact with the traffic is

   (A) wearing course   (B) base course

   (C) sub base   (D) sub grade

175. Travel speed

   (A) Instantaneous speed of a vehicle at a cross section

   (B) $\dfrac{\text{Distance covered}}{\text{Time of travel excluding halting time}}$

   (C) average speed of a vehicle crossing at a particular cross section

   (D) $\dfrac{\text{Distance covered}}{\text{Time of travel including halting time}}$

176. The convexity provided to the carriage way between the crown and the edge of the pavement, is known

   (A) super elevation   (B) camber

   (C) height of the pavement   (D) none of these

177. The steepest gradient permitted on roads which, in ordinary conditions, does not exceed is known as

   (A) rolling gradient   (B) maximum gradient

   (C) exceptional gradient   (D) all the above

178. Reconnaissance is best done with the help of

   (A) aerial photographic survey   (B) cadastral surveys

   (C) topographical survey   (D) triangulation surveys

179. An example of a rigid pavement is

   (A) earthen road   (B) water bound macadam road

   (C) bitumen road   (D) concrete road

180. 'Gauge' on Indian Railways is the

   (A) minimum distance between the running faces of the two inner rails

   (B) distance between the running faces measured 14 mm below the rail table

   (C) distance between the running faces measured 15.88 mm below the rail table

   (D) distance between the running faces measured 16 mm below the rail table

181. The reduction in project time normally results in
    (A)   decreasing the direct cost and increasing indirect cost
    (B)   increasing the direct cost and decreasing the indirect cost
    (C)   increasing the direct and indirect cost both
    (D)   decreasing the direct cost and indirect cost both

182. Consider the following statements :

    In the bar chart planning

    1.   Interdependence of the operations cannot be portrayed
    2.   Progress of work can be measured
    3.   Spare time of the activities can be determined
    4.   Schedule cannot be updated
    (A)   1, 2 and 3 are correct   (B)   1 and 4 are correct
    (C)   2, 3 and 4 are correct   (D)   1, 2 and 4 are correct

183. Consider the following statements :

    In the critical path method of construction planning, free float can be
    1.   Greater than total float
    2.   Greater than independent float
    3.   Equal to total float
    4.   Less than independent float

    Of these statements :
    (A)   1 and 4 are correct   (B)   2 and 3 are correct
    (C)   3 and 4 are correct   (D)   1 and 2 are correct

184. In time-cost optimization of a project, crashing is done
    (A)   on all the activities
    (B)   on all the activities lying on the critical path
    (C)   only on activities lying on the original critical path and having flatter cost slopes
    (D)   on original critical activities and those that become critical at any stage of crashing in the order of ascending cost slope

185. During the construction period, price variation clause in contracts caters to
    (A)   increase in rates of only important materials
    (B)   variation in cost in materials element, labour element and petrol-oil-lubricant element
    (C)   variation in total cost of the project on an adhoc basis
    (D)   rate of inflation

186. Security deposit detected at 5% from contractor's bills is

   (A)   refunded when the contractor has completed the work

   (B)   refunded even before the completion of the work provided good progress has been established

   (C)   retained till expected life of the structure of say 100 years and spent for maintenance

   (D)   refunded when the defect liability period of six months or one monsoon whichever is later is over

187. Sinking fund is

   (A)   The fund for rebuilding a structure when its economic life is over

   (B)   Raised to meet maintenance cost

   (C)   The total sum to be paid to the municipal authorities by the tenants

   (D)   A part of the money kept in reserve for providing additional structures and structural modifications

188. There are three parallel paths in a part of a network between a bursting node and the next merging node with only one activity in each path. The minimum number of dummy arrows needed will be

   (A)   zero   (B)   one

   (C)   two   (D)   three

189. Consider the following operations :

   1.   Drilling

   2.   Blasting

   3.   Mucking

   4.   Placing steel

   5.   Placing concrete

   The correct sequence of these operations in tunnel construction is

   (A)   1, 2, 4, 3, 5   (B)   1, 3, 2, 4, 5

   (C)   1, 2, 3, 4, 5   (D)   1, 3, 4, 2, 5

190. For a given activity, the optimistic time, pessimistic time and the most probable estimates are 5, 17 and 8 days respectively. The expected time is

   (A)   8 days   (B)   9 days

   (C)   10 days   (D)   15 days

191. Weight batching proceeds on

   (A)   The assumption of the declared weight in each bag of cement

   (B)   Weighing the contents of each bag

   (C)   Accurately estimating the weight of each material to be used in each batch

   (D)   The assumption of correct dry weight of each size range of each material and the weight of water

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192. The original cost of an equipment is Rs.10,000. Its salvage value at the end of its total useful life of five years is Rs.1,000. Its book value at the end of two years of its useful life (as per straight line method of evaluation of depreciation) will be

(A) Rs.8,800

(B) Rs.7,600

(C) Rs.6,400

(D) Rs.5,000

193. Mobilization advance up to 10% of the cost of work is given to a contractor

(A) on commencement of work at site for payment of loan taken by him

(B) for the purchase of construction material

(C) for the payment of advances to labour and other staff

(D) for all the activities required to start the work at site on finalization of contract document

194. Consider the following statements :

CPM network helps an engineer to

1. Concentrate his attention on critical activities

2. Divert the resources from non-critical advanced activities to critical activities

3. Be cautious in avoiding any delay in the critical activities in order to avoid delay of the whole project

Of these statements :

(A) 1 and 2 are correct

(B) 2 and 3 are correct

(C) 1 and 3 are correct

(D) 1, 2 and 3 are correct

195. Consider the following statements :

PERT

1. Takes care of uncertainties in the completion time

2. Requires single time estimate

3. Is useful for research and development oriented problem

4. Uses beta distribution probability curve

Of these statements :

(A) 1 and 2 are correct

(B) 1, 3 and 4 are correct

(C) 3 and 4 are correct

(D) 1, 2, 3 and 4 are correct

196. Match List I with List II select the correct answer using the codes given below the lines.

	List I		List II
(a)	Piece work contract	1.	Not practiced in Government
(b)	Lump sum contract	2.	Payment made by detailed measurement of different items
(c)	Item rate contract	3.	Adopted for buildings, roads, bridges and electrical works
(d)	Labour contract	4.	Petty works and regular maintenance work

Codes :

	(a)	(b)	(c)	(d)
(A)	1	2	3	4
(B)	2	3	4	1
(C)	1	4	3	2
(D)	4	3	2	1

197. In PERT analysis, event means

(A) start or finish of a task   (B) time taken for a task

(C) end of an activity   (D) work involved in the project

198. In a bar chart the vertical axis represents

(A) time   (B) types of activities

(C) number of labours   (D) various activities of the project

199. Select the incorrect statement from the following :

(A) Event should be numbered in increasing order from left to right

(B) A pair of numbers should represent one and only one activity

(C) Dummy events should be used for convenience of numbering

(D) All activity arrows should be directed from left to right

200. A dummy activity is that part of the project which

(A) consumes resources   (B) doesn't consume resources

(C) consumes time only   (D) none of the above