BMG
PROVISIONAL ANSWER KEY

Name of the post	**Additional Assistant Engineer (Civil), Class-3, Gandhinagar Municipal Corporation Class-3**
Advertisement No.	**55/2024-25**
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Last Date to Send Suggestion (s)	**07-04-2025**

THE LINK FOR ONLINE OBJECTION SYSTEM WILL START FROM 04-04-2025; 10:00 AM ONWARDS

Instructions / સૂચના

Candidate must ensure compliance to the instructions mentioned below, else objections shall not be considered: -

(1) Candidates have to pay fees of Rs.100/- for each objection. The fees can be paid from the link given herewith.

(2) The Candidate will be able to submit objection only after payment of the fees. The generation of the receipt will only be considered as final submission.

(3) The Candidate must retain the receipt of the payment of the fees. The fees, once paid, will not be refunded under any circumstances.

(4) All the objections should be submitted through **ONLINE OBJECTION SUBMISSION SYSTEM** only. Physical or submission through any other means will not be considered.

(5) All objections are to be submitted with reference to the Master Question Paper published with provisional answer key, published herewith on the website / online objection submission system. Objections should be sent referring to the Question No. & options of the Master Question Paper. Objections regarding question nos. and options other than provisional answer key (Master Question Paper) shall not be considered.

(6) Objections and answers suggested by the candidate should be in compliance with the responses given by him in his answer sheet. Objections shall not be considered, in case, if responses given in the answer sheet /response sheet and submitted objections are differed.

(7) Supportive document to the objection must be uploaded, without which objection will not be considered.

ઉમેદવારે નીચેની સૂચનાઓનું પાલન કરવાની તકેદારી રાખવી, અન્યથા વાંધા-સૂચન અંગે કરેલ રજૂઆતો ધ્યાને લેવાશે નહીં

(1) ઉમેદવારે દરેક વાંધા દીઠ રૂપિયા ૧૦૦/-ફી ભરવાની રહેશે. જે ફી આ સાથે આપેલ લીંક ઉપરથી ભરી શકાશે.

(2) ફી ભર્યા બાદ જ વાંધો સબમીટ થઈ શકશે. ફી ભર્યાની આખરી પહોંચ જ આખરી સબમીશન ગણાશે.

(3) ફી ભર્યાની પહોંચ ઉમેદવારે સાચવી રાખવાની રહેશે. એક વાર ભરેલ ફી કોઈ પણ પરિસ્થિતિમાં પરત આપવામાં આવશે નહિ.

(4) વાંધા ફક્ત **ઓનલાઈન ઓબ્જેકશન સબમીશન સીસ્ટમ** દ્વારા જ સબમીટ કરવાના રહેશે. રૂબરૂ, ટપાલ અથવા ઈ-મેઈલ કે અન્ય કોઈ રીતે આયોગને મોકલવામાં આવેલ વાંધા ધ્યાને લેવામાં આવશે નહીં, જેની ખાસ નોંધ લેવી.

(5) ઉમેદવારે પોતાને પરીક્ષામાં મળેલ પ્રશ્નપુસ્તિકામાં છપાયેલ પ્રશ્નક્રમાંક મુજબ વાંધા-સૂચનો રજૂ ન કરતાં, તમામ વાંધા-સૂચનો વેબસાઈટ પર પ્રસિધ્ધ થયેલ પ્રોવિઝનલ આન્સર કી (માસ્ટર પ્રશ્નપત્ર) ના પ્રશ્નક્રમાંક મુજબ અને તે સંદર્ભમાં રજૂ કરવા. માસ્ટર પ્રશ્નપત્રમાં નિર્દિષ્ટ પ્રશ્ન અને વિકલ્પ સિવાયના વાંધા ધ્યાને લેવામાં આવશે નહીં.

(6) ઉમેદવારે પ્રશ્નના વિકલ્પ પર વાંધો રજૂ કરેલ છે અને વિકલ્પ રૂપે જે જવાબ સૂચવેલ છે એ જવાબ ઉમેદવારે પોતાની ઉત્તરવહીમાં આપેલ હોવો જોઈએ. ઉમેદવારે સૂચવેલ જવાબ અને ઉત્તરવહીનો જવાબ ભિન્ન હશે તો ઉમેદવારે રજૂ કરેલ વાંધા ધ્યાને લેવાશે નહીં.

(7) વાંધા માટે સંદર્ભ જોડવો આવશ્યક છે, જેના વિના વાંધો ધ્યાને લેવામાં આવશે નહીં.

Website link for online objection submission system: https://www.formonline.co.in/GPSC_TRACK/SearchPage.aspx

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1. **In the case of cast iron,**

   (A) there is no yield point

   (B) no necking takes place

   (C) ultimate point and breaking point are one and the same

   (D) all of the above

2. **A tapering rod has diameter d_1 at one end and it tapers uniformly to a diameter d_2 at the other end in a length L. If the modulus of elasticity is E, then the extension of the rod under axial pull P is**

   (A) $\dfrac{PL}{(\pi/4)(d_1 - d_2)^2 E}$

   (B) $\dfrac{PL}{(\pi/4)\left(\dfrac{d_1 d_2}{2}\right)^2}$

   (C) $\dfrac{PL}{(\pi/4)\left(\dfrac{d_1 + d_2}{2}\right)^2 E}$

   (D) $\dfrac{PL}{(\pi/4) d_1 d_2 E}$

3. **The coefficient of thermal expansion of steel is 12×10^{-6}/ °C and that of stainless steel is 18×10^{-6}/ °C. The length of the steel bar is twice the length of the stainless steel bar. The ratio of expansion of steel bar to expansion of stainless steel bar when there is a same rise of temperature is**

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

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

   (C) 4/3

   (D) 1

4. **In a simply supported beam of span L subjected to a concentrated load W at a distance 'a' from one end, the maximum bending moment is**

   (A) Wa

   (B) $\frac{\text{Wa (L – a)}}{\text{L}}$

   (C) W (L – a)

   (D) none of the above

5. **The section modulus of a triangular cross-section of width b and height h is**

   (A) $\frac{bh^2}{36}$

   (B) $\frac{bh^2}{24}$

   (C) $\frac{bh^2}{18}$

   (D) $\frac{bh^2}{12}$

6. **If q_s is maximum shear stress due to torque and G is the modulus of rigidity of material of solid shaft, then the strain energy stored is**

   (A) $\frac{q_s^2}{G}$ **× Volume**

   (B) $\frac{q_s^2}{2G}$ **× Volume**

   (C) $\frac{q_s^2}{4G}$ **× Volume**

   (D) $\frac{q_s^2}{8G}$ **× Volume**

7. In a two-dimensional stress system, p_x, p_y are normal stresses and q is shear stress. Then, the radius of Mohr's circle is

(A) $\frac{p_x + p_y}{2}$

(B) $\sqrt{\left(\frac{P_x + P_y}{2}\right)^2 + q^2}$

(C) $\sqrt{\left(\frac{P_x - P_y}{2}\right)^2 + q^2}$

(D) none of the above

8. A shaft is subjected to a bending stress of 36 N/ mm^2 at a point in a shaft. The shaft is also subjected to direct axial tension of 12 N/ mm^2. The maximum stress in the section is

(A) 48 N/ mm^2

(B) $\sqrt{36^2 + 12^2}$ N/ mm^2

(C) $\frac{36+24}{2} + \sqrt{36^2 - 12^2}$ N/ mm^2

(D) none of the above

9. A cylinder is 300 mm mean diameter with a wall thickness of 1 mm. Calculate the maximum pressure difference allowed between the inside and outside if the stress in the wall must not exceed 150 MPa.

(A) 1 MPa

(B) 2 MPa

(C) 4 MPa

(D) None of the above

10. Considering the following statements, choose the correct answer:

Assertion (A): Bending moment is maximum where shear force is zero.

Reason (R): The relationship between bending moment and shear force is $\frac{dM}{dx} = -F$

(A) Both (A) and (R) are correct and Reason is the correct explanation for the Assertion

(B) Both (A) and (R) are correct, but Reason is not the correct explanation for the Assertion

(C) (A) is correct, but (R) is false

(D) (A) is false, but (R) is correct

11. A simply supported beam 'A' carries a point load at its mid-span. Another identical beam 'B' carries the same magnitude of load but it is uniformly distributed over the entire span. The ratio of the maximum deflections of beams 'A' and 'B' will be

(A) $\frac{8}{3}$

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

(C) $\frac{3}{5}$

(D) $\frac{8}{5}$

12. For a state of plane stress $\sigma_1 = \sigma_x = 40$ MPa and $\sigma_2 = \sigma_y = 20$ MPa. What are the values of the maximum in-plane shearing stress and absolute maximum shearing stress?

(A) (±10, 20) MPa

(B) (±10, 10) MPa

(C) (±20, 10) MPa

(D) (±20, 20) MPa

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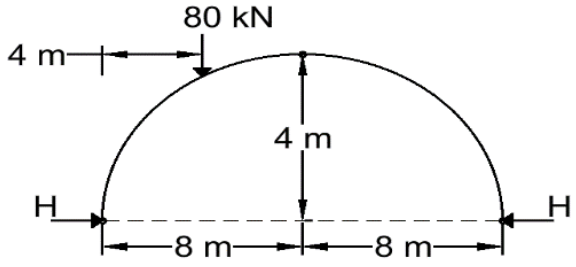
13. A bar of 30 mm diameter and 300 mm length is subjected to an axial load of 100 kN. It elongates by 0.150 mm and the diameter decreases by 0.005 mm. What is the Poisson's ratio of the material of the bar?

(A) 0.25 (B) 0.28

(C) 0.33 (D) 0.37

14. The three-hinged parabolic arch, shown in the figure below, will have value of H as



(A) 20 kN (B) 30 kN

(C) 40 kN (D) 50 kN

15 The maximum shear stress produced in a shaft is 5 N/mm². The shaft is of 40 mm diameter. What is the approximate value of twisting moment?

(A) 628 N-m (B) 63 N-m

(C) 126 N-m (D) 251 N-m

16. A uniform beam of length 2L and flexural rigidity EI is fixed at both ends. What is the moment required for unit rotation at the centre of span?

(A) $\frac{8EI}{L}$ (B) $\frac{6EI}{L}$

(C) $\frac{4EI}{L}$ (D) $\frac{2EI}{L}$

17. Which one of the following is wrong with respect to strain energy method for finding deflection?

(A) Structure should be subjected to a single concentrated load.

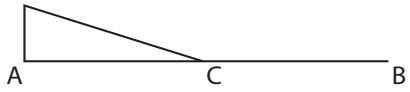
(B) Deflection can be found only at the loaded point.

(C) Deflection can be found only in the direction of load.

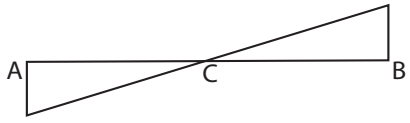
(D) Deflection can be found at any point in desired direction.

18. **Select the correct Influence line diagram for the shear force at point C in the cantilever beam as the shape shown in the options**

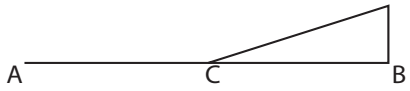
(A)



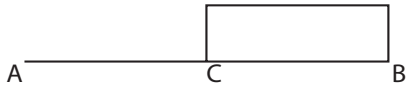
(B)



(C)



(D)

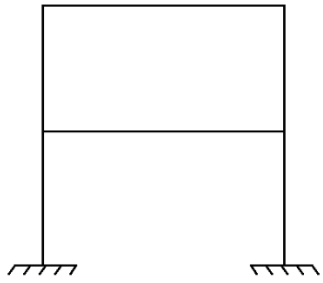


19. **A parabolic arch has springings A and B at different levels. The height of crown point C from A is h_1 and from B it is h_2. If L is span, then the horizontal distance of AC is**

(A) $\frac{L\sqrt{h_1}}{\sqrt{h_1}+h_2}$ **(B)** $\frac{L\sqrt{h_1}}{\sqrt{h_1}+\sqrt{h_2}}$

(C) $\frac{L\sqrt{h_2}}{\sqrt{h_1}+h_2}$ **(D)** $\frac{L\sqrt{h_2}}{\sqrt{h_1}+\sqrt{h_2}}$

20. **The degree of static indeterminacy of the frame shown in the figure below is**



(A) 4 **(B) 5**

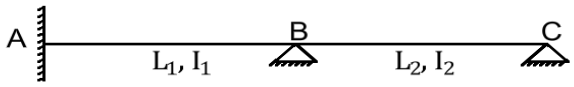
(C) 6 **(D) 7**

21. **A propped cantilever of span L is fixed at end A and simply supported at end B. Due to a concentrated load W at mid-span, reaction at B is**

(A) $\frac{3W}{16}$ **(B)** $\frac{5W}{8}$

(C) $\frac{5W}{16}$ **(D)** $\frac{7W}{16}$

22. For unyielding supports, the slope deflection equation for the beam shown in the figure below is



(A) $M_{BC} = M_{FBC} + \frac{2EI_2}{L_2}(2\theta_B + \theta_C)$

(B) $M_{BC} = M_{FBC} + \frac{2EI_2}{L_2}(\theta_B + 2\theta_C)$

(C) $M_{BC} = M_{FBC} + \frac{2EI_2}{L_2}(2\theta_B + \theta_C) + \frac{1}{2} M_{FCB}$

(D) $M_{BC} = M_{FBC} + \frac{2EI_2}{L_2}(\theta_B + 2\theta_C) + \frac{1}{2} M_{FCB}$

23. A semicircular two hinged arch of radius R is subjected to a uniformly distributed load w/unit length over entire span. Assuming EI to be constant, horizontal trust developed is

(A) $\frac{3}{4}\frac{wR}{\pi}$ (B) $\frac{wR}{\pi}$

(C) $\frac{4}{3}\frac{wR}{\pi}$ (D) None of the above

24. In the working stress method of reinforced concrete design, the modular ratio between steel and concrete used is

(A) $\frac{230}{3\sigma_{bc}}$ (B) $\frac{230}{\sigma_{bc}}$

(C) $\frac{280}{3\sigma_{bc}}$ (D) $\frac{280}{\sigma_{bc}}$

25. The partial safety factor for steel for limit state of collapse is

(A) 1.0 (B) 1.15

(C) 1.2 (D) 1.5

26. The partial safety factor for dead load, imposed load, and wind load for limit state of serviceability are _____ respectively

(A) 1.0, 0.8, 0.8 (B) 1.0, 1.0, 1.0

(C) 1.2, 1.2, 1.2 (D) 1.5, 1.5, 1.5

27. The centroid of a compression block represents stress in concrete at limit state, the distance of centroid of a compression block from extreme compression edge is

(A) 0.36 x_u (B) 0.42 x_u

(C) 0.48 x_u (D) 0.53 x_u

where x_u = depth of compression cone.

28. According to the Indian Road Congress, what is the value of exceptional gradient for road to be constructed in plain and rolling terrain?

(A) 1 in 20

(B) 1 in 15

(C) 1 in 14.3

(D) 1 in 12.5

29. If a section of overall depth D and width b is subjected to design moment M_u, design bending shear V_u and design torque T_u, then the section should be designed for

(A) $V_e = V_u + \frac{T_u}{1.6\ b}$

(B) $V_e = V_u + 1.6\ \frac{T_u}{b}$

(C) $V_e = V_u + T_u\ \frac{D}{1.6\ b}$

(D) $V_e = V_u + 1.6\ T_u\ \frac{D}{b}$

30. IS 456–2000 recommends that in any column, reinforcement shall not be more than

(A) 3% of gross sectional area of the column

(B) 4% of gross sectional area of the column

(C) 6% of gross sectional area of the column

(D) 8% of gross sectional area of the column

31. The following statements are about the characteristics of yield line pattern in a slab.

(i) Yield lines are straight lines.

(ii) Yield lines either terminate at the boundary of the slab or at the intersection of other yield lines.

(iii) Each segment of slab will be having axes of rotation all along its periphery.

In the above statements

(A) (i), (ii) and (iii) are correct

(B) Only (i) and (ii) are correct

(C) Only (ii) and (iii) are correct

(D) Only (i) and (iii) are correct

32. Considering the following statements, choose the correct answer:

Assertion (A): In working stress method of design, there is no need to check for serviceability requirement.

Reason (R): The working stresses considered permissible stresses for materials which are low.

(A) Both (A) and (R) are correct and reason is the correct explanation for the assertion

(B) Both (A) and (R) are correct, but reason is not the correct explanation for the assertion

(C) (A) is correct, but (R) is false

(D) (A) is false, but (R) is correct

33. Torsion resisting capacity of a given RC section

(A) decreases with decrease in stirrup spacing

(B) decreases with increase in longitudinal bars

(C) does not depend upon stirrup and longitudinal steels

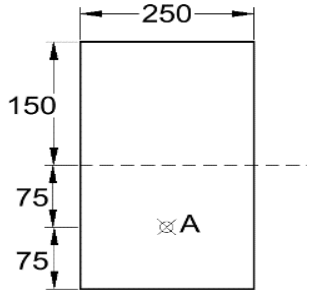
(D) increases with the increase in stirrup and longitudinal steels

34. Limit state of serviceability for deflection, including the effects due to creep, shrinkage and temperature occurring after the erection of partitions and application of finishes applicable to floors and roofs is restricted to

(A) $\frac{\text{span}}{150}$ (B) $\frac{\text{span}}{200}$

(C) $\frac{\text{span}}{250}$ (D) $\frac{\text{span}}{350}$

35. In the prestressed concrete beam section, shown in the figure below (all dimensions in mm in the figure), if the net losses are 15% and final prestressing force applied at 'A' is 500 kN, the initial extreme fibre stresses at top and bottom will be _____ respectively.



(A) – 3.40 N/mm² and 16.70 N/mm²

(B) – 3.40 N/mm² and 19.60 N/mm²

(C) – 4.0 N/mm² and 16.70 N/mm²

(D) – 4.0 N/mm² and 19.60 N/mm²

36. What is the value of flexural strength of M 25 concrete?

(A) 4.0 MPa

(B) 3.5 MPa

(C) 3.0 MPa

(D) 1.75 MPa

37. Drop panel is a structural component in

(A) Grid floor

(B) Flat plate

(C) Flat slab

(D) Slab-beam system of floor

38. What is the uplift at the centre on the release of wires from anchors due to pre-tensioning only for force 'P' and eccentricity 'e' for a pre-tensioned rectangular plank?

(A) $\frac{PeL^2}{6EI}$ (B) $\frac{Pe^2L}{6EI}$

(C) $\frac{PeL^2}{8EI}$ (D) $\frac{Pe^2L}{8EI}$

39. If *t* is the thickness of a thinner member and *p* is the pitch in the bolted connection of a compression member, the pitch shall not be more than

(A) 16*t* or 200 mm, whichever is less

(B) 16*t* or 200 mm, whichever is more

(C) 12*t* or 200 mm, whichever is less

(D) 12*t* or 180 mm, whichever is less

40. If γ_{ml} is a partial safety factor, f_u is an ultimate stress and A_n is a net effective area, then the tensile strength of a bolted connection is

(A) $0.8\frac{A_nf_u}{\gamma_{ml}}$ (B) $0.9\frac{A_nf_u}{\gamma_{ml}}$

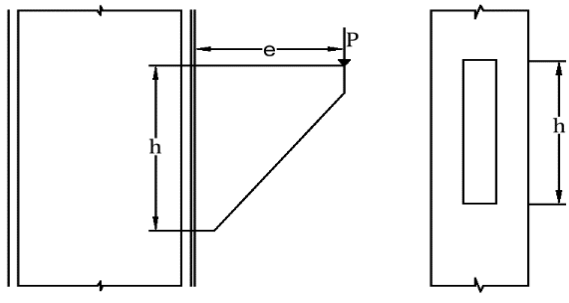
(C) $\frac{A_nf_u}{\gamma_{ml}}$ (D) $1.1\frac{A_nf_u}{\gamma_{ml}}$

41. If the length of welded joint l_j is greater than 150t, where t is the throat thickness, the design capacity of weld shall be reduced by

(A) 0.8 (B) $1.2 - \frac{0.2l_j}{150t}$

(C) $1 - \frac{0.2l_j}{150t}$ (D) $1.2 - \frac{0.3l_j}{150t}$

42. In the bracket shown in the figure below, the maximum bending stress in the weld is



(A) $\frac{Pe}{6th^2}$ (B) $\frac{Pe}{4th^2}$

(C) $\frac{3Pe}{th^2}$ (D) $\frac{6Pe}{th^2}$

43. Lacing shall be designed to resist transverse shear V_t equal to

(A) 2.5% of P
(B) 4.0% of P
(C) 5.0% of P
(D) 10.0% of P

44. In a plate girder with vertical stiffeners and two horizontal stiffeners, the minimum thickness of web is

(A) $\frac{d}{200}$
(B) $\frac{d}{250}$
(C) $\frac{d}{340}$
(D) $\frac{d}{400}$

45. In gantry girders, lateral deflection should be restricted to

(A) $\frac{span}{200}$
(B) $\frac{span}{300}$
(C) $\frac{span}{400}$
(D) $\frac{span}{500}$

46. Autoclaved Aerated Concrete (AAC) blocks achieve their lightweight structure primarily due to

(A) High cement content
(B) Air-entraining agents
(C) Aluminium powder reacting with lime
(D) Foaming admixtures

47. Which of the following properties is least desirable for high-performance fiber-reinforced concrete (HPFRC)?

(A) High ductility
(B) High tensile strength
(C) Low permeability
(D) High creep

48. Shape Memory Alloys are used in seismic-resistant structures due to their

(A) High compressive strength
(B) Ability to return to original shape after deformation
(C) Corrosion resistance in marine environment
(D) High thermal conductivity

49. Geopolymer concrete differs from ordinary Portland cement concrete mainly due to

(A) Absence of calcium silicate hydrate as a binding phase
(B) Higher carbon footprint due to its composition
(C) Requirement of lower curing temperatures
(D) Formation of calcium hydroxide during hydration

50. Which of the following phase change materials (PCMs) is most commonly used in thermally efficient buildings?

(A) Paraffin wax
(B) Aluminium oxide
(C) Hydrated lime
(D) Calcium carbonate

51. In self-healing concrete, bacterial activity promotes crack healing by producing

(A) Calcium hydroxide
(B) Calcium carbonate
(C) Calcium silicate hydrate
(D) Magnesium oxide

52. The primary reason for using ice as a replacement for water in concrete mixing during hot weather is to

(A) Improve the compressive strength of concrete
(B) Reduce the concrete temperature and delay setting time
(C) Decrease the water to cement ratio
(D) Increase the cement hydration rate

53. The correct sequence of steps in concrete mix design as per IS 10262 is

(A) Target strength → Water-cement ratio selection → Aggregate proportioning → Workability check
(B) Workability check → Target strength → Water-cement ratio selection → Aggregate proportioning
(C) Aggregate proportioning → Target strength → Workability check → Water-cement ratio selection
(D) Target strength → Aggregate proportioning → Water-cement ratio selection → Workability check

54. The main reason why calcium chloride is used as an admixture in cold weather concreting is

(A) To improve workability
(B) To reduce shrinkage cracks
(C) To increase long-term durability
(D) To accelerate setting time and early strength gain

55. If a designed concrete mix has a target strength of 38.3 MPa and the standard deviation is 5 MPa, then the characteristic strength as per IS 456:2000 is

(A) 35 MPa
(B) 40 MPa
(C) 30 MPa
(D) 45 MPa

56. In concrete mix design, the concept of "Packing Density" is used to

(A) Reduce the cement content by optimizing the aggregate combination

(B) Increase the permeability of concrete

(C) Improve the strength of concrete by increasing voids in the mix

(D) Reduce the workability of fresh concrete

57. Which of the following measures can be used to reduce the risk of delayed ettringite formation (DEF) in concrete?

(A) Increasing the sulphate content in cement

(B) Using steam curing at very high temperatures

(C) Keeping the curing temperature below 70°C

(D) Increasing the water-cement ratio

58. The presence of excess carbon in steel results in

(A) Increased ductility and toughness

(B) Higher brittleness and hardness

(C) Improved weldability

(D) Increased resistance to corrosion

59. In Ashlar masonry, the most durable bond is

(A) Random rubble bond

(B) Coursed rubble bond

(C) Ashlar chamfered bond

(D) Ashlar finedressed bond

60. Stainless steel is used in aggressive environments because of the presence of

(A) High carbon content

(B) Aluminium, which increases corrosion resistance

(C) Nickel, which enhances tensile strength

(D) Chromium, which forms a passive oxide layer

61. The primary cause of warping in timber is

(A) Uneven moisture loss and differential shrinkage

(B) Excessive resin content in the wood

(C) Presence of knots and defects

(D) Exposure to fungal attack

62. The decay of timber caused by white rot fungi affects

(A) Only the lignin in the wood

(B) Both cellulose and hemicellulose

(C) Both cellulose and lignin

(D) The resin content of the wood

63. Which of the following statements about laterite stone is false?

(A) It hardens when exposed to air

(B) It is highly porous and light-weighted

(C) It has high compressive strength compared to granite

(D) It is commonly used in coastal regions

64. The most effective preservative treatment for timber exposed to marine environments is

(A) Coal tar coating

(B) Copper-chrome-arsenate (CCA) pressure treatment

(C) Creosote oil treatment

(D) Linseed oil application

65. The efflorescence in bricks is mainly caused due to the presence of

(A) Excess iron oxide

(B) Soluble salts like sulphates and chlorides

(C) High alumina content

(D) Low water absorption

66. The most common reason for the black core in overburnt bricks is

(A) Insufficient oxygen supply in the kiln

(B) High temperature during burning

(C) Excess water in the brick mix

(D) Presence of excessive silica

67. The best type of clay for making high-strength bricks is

(A) Sandy clay

(B) Calcareous clay

(C) Alumina-rich clay

(D) Lateritic clay

68. Which of the following is not a commonly used chemical component in water-reducing admixtures?

(A) Polycarboxylate ethers

(B) Lignosulfonates

(C) Calcium nitrite

(D) Melamine formaldehyde

69. Which of the following statements about HVAC (Heating, Ventilation and Air Conditioning) duct design is correct?

(A) The velocity of air in ducts should be as high as possible to improve airflow

(B) Ducts should be designed with gradual bends to reduce pressure losses

(C) The use of flexible ducts is always preferable to rigid ducts

(D) A single large duct is more efficient than multiple smaller ducts

70. The thermal conductivity of a material is measured in

(A) W/m^2K

(B) J/kgK

(C) kN/m^3

(D) W/mK

71. The "Sound Transmission Class" (STC) rating of a wall measures

(A) The reduction in airborne sound transmission through the wall

(B) The amount of sound reflected by a surface

(C) The ability of the wall to absorb sound energy

(D) The effect of humidity on sound insulation

72. Which wireless communication technology is most commonly used in IoT-based smart buildings for sensor networks?

(A) Bluetooth

(B) Zigbee

(C) Infrared

(D) Fiber optics

73. In smart buildings, the term "Digital Twin" refers to

(A) A backup server for communication systems

(B) A secondary internet connection for redundancy

(C) A wireless communication network using 5G

(D) A virtual model of a building that monitors real-time performance

74. In black cotton soil, which type of foundation is most effective in preventing structural failure due to soil expansion and contraction?

(A) Shallow foundation

(B) Mat foundation

(C) Under-reamed pile foundation

(D) Strip footing

75. In structural design, the term "spandrel beam" refers to a beam that

(A) Supports a floor slab in a framed structure

(B) Connects columns at floor levels to carry external wall loads

(C) Transfers loads directly to the foundation

(D) Supports the roofing system in industrial sheds

76. The main advantage of a "bubble diagram" in building planning is

(A) It represents electrical circuits in a building

(B) It shows the logical relationship between different spaces

(C) It calculates the load-bearing capacity of columns

(D) It is used for detailing reinforcement in structural elements

77. The term "embodied energy" in sustainable building materials refers to

(A) The energy used in the production, transportation and disposal of a material

(B) The energy required to operate the building

(C) The thermal resistance of a material

(D) The natural energy, a material absorbs from sunlight

78. The "soft story" failure in earthquakes occurs when

(A) The foundation of a building is too rigid

(B) The building is constructed on a rocky terrain

(C) The structure is entirely made of steel

(D) The lower floors of a structure have significantly less lateral stiffness compared to the upper floors

79. Creep in concrete is primarily caused by

(A) Progressive microcracking and movement of water in the gel pores

(B) Elastic deformation under load

(C) The reduction in porosity over time

(D) Increase in the compressive strength

80. The interfacial transition zone (ITZ) forms around aggregate particles in concrete due to

(A) Excess hydration in this region

(B) Strong bonding between the aggregate and cement paste

(C) The wall effect, which reduces packing density and increases porosity

(D) Lower water-cement ratio in the region

81. Which of the following is not an effect of creep in prestressed concrete structures?

(A) Loss of prestress force

(B) Increase in deflections

(C) Redistribution of stress

(D) Increased relaxation loss of prestressing tendons

82. The type of shrinkage that occurs before concrete sets is called
(A) Autogenous shrinkage
(B) Plastic shrinkage
(C) Carbonation shrinkage
(D) Drying shrinkage

83. The term "creep coefficient" in creep measurement refers to
(A) The ratio of creep strain to initial elastic strain
(B) The total stress applied per unit deformation
(C) The reduction in compressive strength due to long-term loading
(D) The increase in tensile strain in concrete

84. Which of the following losses occurs only in post-tensioned concrete members?
(A) Elastic shortening
(B) Anchorage slip
(C) Creep loss
(D) Shrinkage loss

85. The phenomenon of relaxation of steel in prestressed concrete refers to
(A) The reduction in strain under constant stress
(B) The increase in stress due to temperature variations
(C) The decrease in stress in the tendon under constant strain
(D) The immediate loss of prestress after anchoring

86. In a construction schedule, if total float is zero for an activity, it means
(A) The activity can be delayed without affecting the project
(B) The activity is not on the critical path
(C) The activity must be completed on time to avoid project delay
(D) The activity has no dependencies

87. In a project network, an activity has an Early Start (ES) of 5 days and an Early Finish (EF) of 10 days. If the Total Float (TF) for the activity is 3 days, then what is its Late Start (LS)?
(A) 5 days
(B) 8 days
(C) 10 days
(D) 12 days

88. In a project, if the Schedule Performance Index (SPI) is 0.90 and the Cost Performance Index (CPI) is 1.10, what does this indicate?
(A) The project is behind schedule but under budget
(B) The project is behind schedule and over budget
(C) The project is ahead of schedule but over budget
(D) The project is ahead of schedule and under budget

89. Hammock activities in project scheduling are used to

(A) Represent activities with uncertain durations

(B) Connect two major milestones in a project

(C) Summarize multiple small activities without detailing each one

(D) Represent slack time in project networks

90. A loader has a bucket capacity of 2.5 cubic meters. If the cycle time is 45 seconds and the efficiency factor is 0.8, then what is the hourly output in cubic meters?

(A) 200 (B) 240

(C) 320 (D) 160

91. A tower crane lifts a 2-ton load in 1 minute and takes 1.5 minutes to return to its original position. If it operates at 85% efficiency, then how many tons of loads can it completely lift in one hour?

(A) 30 (B) 40

(C) 34 (D) 36

92. In a two-envelope tendering system, what is the primary reason for separating technical and financial bids?

(A) To prevent financial influence on technical evaluation

(B) To reduce the total bid evaluation time

(C) To allow bidders to modify their financial bids later

(D) To ensure lower project costs

93. If the Mean Time Between Failures (MTBF) of a piece of equipment is 500 hours and the Mean Time to Repair (MTTR) is 5 hours, then what is the equipment availability?

(A) 1.01% (B) 96%

(C) 98% (D) 99%

94. The method used for estimating depreciation of building assets over time is

(A) Compound interest method

(B) Square root method

(C) Straight-line method

(D) Cost-volume-profit method

95. Which of the following is a major disadvantage of cathodic protection in reinforced concrete structures?

(A) High initial cost and maintenance

(B) Ineffectiveness in chloride-contaminated environments

(C) Difficulty in monitoring

(D) Causes excessive shrinkage in concrete

96. Which of the following is a 1:1 clay mineral?

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

97. Which of the following is observed when the compactive effort is increased in a proctor compaction test performed on a particular soil?

(A) OMC increases and MDD decreases
(B) OMC decreases and MDD increases
(C) OMC increases and MDD remains same
(D) MDD increases but OMC remains same

98. Which type of roller is most suitable for compacting a CH soil?

(A) Smooth drum roller
(B) Sheep foot roller
(C) Vibratory roller
(D) None of these

99 If the target dry unit weight is 20 kN/m^3 and the relative compaction to be attained in the field is 90%, then the field dry density should be

(A) 18 kN/m^3
(B) 1.83 gm/cc
(C) 22.22 kN/m^3
(D) None of these

100. If the LL and PI of a given fine-grained soil is plotted on the plasticity chart and falls above A-line, it will be classified as

(A) Sand
(B) Gravel
(C) Clay
(D) Silt

101. If a fine-grained inorganic soil has its LL and PI plotted below A-line and the LL is 52, it will be classified as

(A) CH
(B) CL
(C) MH
(D) ML

102. For a soil classified as SP, the fines content of the soil should be

(A) < 5%
(B) 5% to 12%
(C) >12 %
(D) None of these

103. Consolidation test should be performed on

(A) Disturbed samples
(B) Undisturbed samples
(C) Oven dried remoulded samples
(D) None of these

104. In a constant head permeability test, if 150 cm head of water is maintained (measured vertically above the outlet), and the outlet is exposed to the atmosphere, then the head loss incurred by water while passing through the specimen is

(A) 150 cm
(B) 100 cm
(C) 125 cm
(D) 75 cm

105. If pressure head at a point in a soil specimen is – (negative) 40 cm, and a piezometer is connected at that point, then the height of rise of water in the piezometer would be

(A) 40 cm
(B) 20 cm
(C) 80 cm
(D) no rise in water, rather air will be sucked inside

106. If back pressure of 200 kPa is used during the consolidation stage of a triaxial test and the consolidation has to be done at an effective confining pressure of 100 kPa, then the cell pressure required should be

(A) 100 kPa
(B) 300 kPa
(C) 200 kPa
(D) None of these

107. During the shearing stage of a CD triaxial test, which of the following should be recorded?

(A) Load, deformation and pore water pressure
(B) Load, deformation and volume change
(C) Pore water pressure and volume change
(D) None of the above

108. Hydrometer analyses is used to determine

(A) Silt and clay sized fraction
(B) Sand-sized fraction
(C) Gravel-sized fraction
(D) None of these

109. If a head loss of 0.5 m takes place when water flows through a 1 m thick soil layer, then the seepage force per 1 m^3 volume is

(A) 9.81 kN
(B) 4.90 kN
(C) 0.5 kN
(D) None of these

110. A 1 m thick soil layer having $k_1 = 1 \times 10^{-3}$ cm/s lies on a 2 m thick soil layer having $k_2 = 2.5 \times 10^{-3}$ cm/s, the equivalent k for horizontal flow through these horizontal stratified layers is

(A) 2×10^{-3} cm/s
(B) 1.7×10^{-3} cm/s
(C) 2.25×10^{-3} cm/s
(D) None of these

111. If the deviatoric stresses for three UU tests are 100 kPa, 100.5 kPa and 99.5 kPa, then the undrained shear strength of the soil is

(A) 100 kPa
(B) 200 kPa
(C) 50 kPa
(D) None of these

112. If a 100 kPa stress is applied on a 2 m × 2 m footing, then the average value of stress increase at a depth of 2 m below the base of the footing is

(A) 100 kPa
(B) 70 kPa
(C) 25 kPa
(D) 5 kPa

113. 100 kPa stress is applied on an irregular shaped footing. On a Newmark's chart having influence value of 0.01, the number of curved boxes covered by the top-view of the footing (drawn to proper scale corresponding to the depth at which the vertical stress increase is to be estimated) is 20. The stress increase that could be estimated using the Newmark's chart is

(A) 20 kPa
(B) 100 kPa
(C) 45 kPa
(D) 30 kPa

114. Which of the following type of compression curve could be plotted live while performing a 1D consolidation test?

(A) e-p'
(B) e-log p'
(C) ϵ-p'
(D) None of these

115. If the current existing average overburden pressure experienced by a saturated clay layer is 125 kPa, OCR = 2 and average stress increase due to construction of infrastructure is 50 kPa, then which of the following slope of e-log p′ curve would be needed to estimate the magnitude of primary consolidation settlement?

(A) Slope of recompression curve
(B) Slope of virgin compression curve
(C) Slope of both recompression curve and virgin compression curve
(D) None of the above

116. If LL of a NC clay having low to medium sensitivity is 50 and if 1D consolidation test results are not available, then the compression index that could be considered for preliminary estimation of consolidation settlement of the clay layer as per Terzaghi and Peck (1967) is

(A) 0.36
(B) 0.06
(C) 0.01
(D) None of these

117. For a retaining wall, typically which of the following is desirable?

(A) FOS against overturning > FOS against sliding
(B) FOS against overturning < FOS against sliding
(C) FOS against overturning = FOS against sliding
(D) None of the above

118. If soil friction angle is 30 degree, interface friction angle is 20 degree and back face of retaining wall inclined at an angle of 80 degree with the horizontal, then the angle between the active force vector and weight vector for Coulomb's theory is

(A) 60 degree (B) 50 degree (C) 30 degree (D) 20 degree

119. If the friction angle of the soil is 40 degree, then the angle made by the sides of the triangular Rankine passive zones (with the horizontal) for Terzaghi's bearing capacity theory for shallow foundation is

(A) 25 degree (B) 40 degree

(C) 65 degree (D) 30 degree

120. A clay layer extends from the ground surface to a depth of 2 m. It is underlain by a sand layer of 10 m thickness, which is underlain by rock. The water table is located at a depth of 1 m below ground surface. If the moist unit weight of clay is 20 kN/m^3, saturated unit weight of clay is 22 kN/m^3 and saturated unit weight of sand is 21 kN/m^3, then the total stress at a depth of 5 m below ground surface is

(A) 105 kPa (B) 250 kPa

(C) 252 kPa (D) 50 kPa

121. For the Schmertmann's method for estimating settlement of shallow foundation, the correction factor to account for the effect of creep for 10 years is

(A) 1.4 (B) 0.7

(C) 0.5 (D) 0.9

122. When test results are plotted in terms of the void ratio versus the logarithm of effective stress, then the slope of the virgin compression curve is

(A) C_c (B) m_v

(C) a_v (D) C_r

123. Field plate load test is conducted at

(A) Expected depth of actual footing (B) 2 times expected depth of actual footing

(C) 0.5 times expected depth of actual footing (D) always conducted at the ground surface

124. Plate load test is conducted on clayey soil using 30 cm wide plate. The actual footing is expected to be of 1 m. For a given intensity of loading, the plate settles by 6 mm, the expected settlement of the actual footing at the same intensity of loading is

(A) 5 mm (B) 20 mm (C) 25 mm (D) 40 mm

125. The shape factor for a square shallow foundation as per IS 6403 is

(A) $s_c = 1; s_q = 1; s_\gamma = 1$ (B) $s_c = 1.3; s_q = 1.2; s_\gamma = 0.6$

(C) $s_c = 1.3; s_q = 1.2; s_\gamma = 0.8$ (D) $s_c = 1.3; s_q = 1; s_\gamma = 0.8$

126. For the λ method of estimating skin friction of a 9 m long pile passing through 5 m thick clay layer having undrained cohesion of 200 kPa and another clay layer having 4 m thickness and undrained cohesion of 250 kPa, the cohesion value that should be used for estimation of unit frictional resistance is

(A) 222.2 kPa (B) 225.50 kPa

(C) 200 kPa (D) 250 kPa

127. An SP soil having 1% of the soil passing 75 micron has to be improved. The most preferred ground improvement technique is

(A) Cement stabilization (B) Lime stabilization

(C) Compaction using sheep foot roller (D) None of these

128. The fall height of the hammer for performing SPT as per IS 2131 is

(A) 60 cm (B) 75 cm

(C) 45 cm (D) 30 cm

129. If the number of blows needed for penetration of 0 to 6 in., 6 in. to 12 in., and 12 in. to 18 in. are 10, 15 and 20 respectively, then the field SPT blow count is

(A) 45 (B) 35

(C) 15 (D) 20

130. If a hammer of 80% efficiency is used and field N value is 21, then the N_{60} is

(A) 28 (B) 15

(C) 16 (D) 21

131. If the SPT blow count corrected for overburden pressure is 21, and the corresponding soil type was saturated fine sand and silt, then the corrected N value after accounting for dilatancy correction is

(A) 20 (B) 18

(C) 15 (D) None of these

132. If friction ratio estimated from CPT result is found to be less than 1%, then the soil type is expected to be

(A) Silt (B) Lean clay

(C) Fat clay (D) Clean sand

133. In the ordinary method of slices of slope stability analysis, which of the following is satisfied?

(A) Moment equilibrium (B) Force equilibrium

(C) Both force and moment equilibrium (D) None of these

134. The main purpose of geogrid is

(A) Reinforcement (B) Separation

(C) Drainage (D) None of these

135. Which of the following primarily provides 3D confinement?

(A) Geocells
(B) Geotextile
(C) Geopipe
(D) None of these

136. Which of the following is NOT an assumption in deriving Bernoulli's equation?

(A) Inviscid flow
(B) Steady flow
(C) Compressible flow
(D) No heat transfer

137. Which of the following forces is neglected in Euler's equation of motion?

(A) Viscous force
(B) Gravity force
(C) Pressure force
(D) Inertial force

138. Which of the following is a dimensionless number used to compare inertial and gravitational forces?

(A) Reynolds number
(B) Froude number
(C) Weber number
(D) Mach number

139. What type of flow occurs in open channels when the Froude number is greater than 1?

(A) Subcritical flow
(B) Supercritical flow
(C) Critical flow
(D) Laminar flow

140. Which of the following causes major energy loss in a pipe flow system?

(A) Pipe bends
(B) Sudden expansion
(C) Friction
(D) Valves

141. In pipe network problems, which equation is used to analyze head loss?

(A) Darcy-Weisbach equation
(B) Bernoulli's equation
(C) Reynolds equation
(D) Hagen-Poiseuille equation

142. Which equation best describes laminar flow in a circular pipe?
(A) Navier-Stokes equation
(B) Hagen-Poiseuille equation
(C) Manning's equation
(D) Darcy-Weisbach equation

143. What is the effect of increasing pipe diameter on head loss due to friction?
(A) Increases
(B) Decreases
(C) Remains the same
(D) Becomes zero

144. Which of the following is a low-head, high-discharge turbine?
(A) Pelton turbine
(B) Francis turbine
(C) Kaplan turbine
(D) Impulse turbine

145. The function of a draft tube in a reaction turbine is to
(A) Convert kinetic energy into pressure energy
(B) Increase velocity of water
(C) Store water temporarily
(D) Remove air bubbles

146. Which type of pump is best suited for high-head and low-discharge applications?
(A) Centrifugal pump
(B) Reciprocating pump
(C) Axial flow pump
(D) Propeller pump

147. The hydraulic efficiency of a turbine is given by
(A) Ratio of power developed by runner to input power
(B) Ratio of power at shaft to input power
(C) Ratio of power at nozzle to power at runner
(D) Ratio of output power to electrical input

148. Which of the following is NOT a component of the hydrological cycle?
(A) Precipitation
(B) Transpiration
(C) Infiltration
(D) Radiation

149. Runoff in a catchment area depends on
(A) Soil type
(B) Land use
(C) Rainfall intensity
(D) All of the above

150. Which of the following methods is used to estimate flood discharge?
(A) Rational method
(B) Unit hydrograph method
(C) SCS curve number method
(D) All of the above

151. Base flow in a stream is primarily contributed by
(A) Rainfall
(B) Surface runoff
(C) Groundwater
(D) Snowmelt

152. Which factor does NOT influence the evaporation rate from a water body?
(A) Wind speed
(B) Humidity
(C) Temperature
(D) Soil porosity

153. The purpose of a gravity dam is to
(A) Withstand water pressure using its weight
(B) Store irrigation water
(C) Generate hydroelectric power
(D) All of the above

154. Cross drainage works are used to
(A) Carry water across natural streams
(B) Prevent floods
(C) Store water for irrigation
(D) Distribute irrigation water

155. Which parameter is used to measure irrigation efficiency?
(A) Water application efficiency
(B) Water use efficiency
(C) Water distribution efficiency
(D) All of the above

156. The main purpose of a drop structure in an irrigation system is to
(A) Reduce velocity
(B) Prevent soil erosion
(C) Regulate flow
(D) All of these

157. Which among the following is an example of an incompressible fluid?
(A) Water
(B) Steam
(C) Air
(D) Hydrogen gas

158. Which statement is TRUE for a Newtonian fluid?
(A) Shear stress is directly proportional to strain
(B) Shear stress is directly proportional to strain rate
(C) Shear stress is independent of strain rate
(D) None of the above

159. In an ideal fluid flow, which of the following forces is NOT considered?
(A) Inertial force
(B) Gravity force
(C) Viscous force
(D) Pressure force

160. The head loss in a pipe due to friction varies approximately with
(A) Square of velocity
(B) Cube of velocity
(C) Inverse of velocity
(D) Square root of velocity

161. Which flow measurement device works on the principle of a converging-diverging section?
(A) Pitot tube
(B) Venturimeter
(C) Orifice meter
(D) Rotameter

162. A hydraulic jump in an open channel flow is associated with
(A) Loss of energy
(B) Increase in velocity
(C) Gain in energy
(D) Uniform flow

163. What is the main function of an air vessel in a reciprocating pump?
(A) To increase pump efficiency
(B) To reduce acceleration head
(C) To reduce cavitation
(D) To increase discharge

164. Cavitation in hydraulic machines occurs due to
(A) High pressure
(B) Low pressure
(C) High velocity
(D) High temperature

165. Specific speed of a pump gives an idea about its
(A) Head
(B) Efficiency
(C) Type
(D) Power

166. A hyetograph represents
(A) Rainfall intensity vs time
(B) Discharge vs time
(C) Cumulative rainfall vs time
(D) Evaporation vs time

167. Which of the following methods is used for estimating flood discharge?
(A) Rational method
(B) Unit hydrograph method
(C) Muskingum method
(D) All of these

168. The term 'return period' in hydrology refers to
(A) Time interval between successive floods of a given magnitude
(B) Time taken for infiltration to occur
(C) Time for runoff to reach the river
(D) None of the above

169. The infiltration capacity of soil decreases with
(A) Increase in moisture content
(B) Decrease in compaction
(C) Increase in porosity
(D) None of the above

170. Which of the following is NOT a type of aquifer?
(A) Confined aquifer
(B) Unconfined aquifer
(C) Artesian aquifer
(D) Clayey aquifer

171. The coefficient of permeability of a soil sample depends on
(A) Grain size
(B) Void ratio
(C) Temperature
(D) All of the above

172. In hydrology, unit hydrograph theory applies to
(A) Large catchments only
(B) Small catchments only
(C) Both large and small catchments
(D) Snow-fed rivers only

173. What is the primary function of a check dam?
(A) Store large amounts of water
(B) Reduce soil erosion
(C) Generate hydroelectricity
(D) Improve groundwater recharge

174. Which soil type has the highest water-holding capacity?
(A) Sandy soil
(B) Silty soil
(C) Clayey soil
(D) Loamy soil

175. In India, the major source of irrigation is
(A) Canals
(B) Wells and tubewells
(C) Tanks
(D) Sprinklers

176. Delta in irrigation refers to
(A) Total depth of water required by a crop
(B) Amount of rainfall required
(C) Loss of water in transit
(D) Velocity of water in a canal

177. Waterlogging in irrigation can be controlled by
(A) Increasing drainage
(B) Reducing irrigation frequency
(C) Using deep-rooted crops
(D) All of the above

178. Which type of canal is used to take water directly from a river?
(A) Perennial canal
(B) Inundation canal
(C) Lined canal
(D) Contour canal

179. Sprinkler irrigation is most suitable for
(A) Sandy soil
(B) Clayey soil
(C) Saline soil
(D) Loamy soil

180. Which structure is used to prevent floods in rivers?
(A) Barrage
(B) Weir
(C) Embankment
(D) Reservoir

181. Which among the following is a reaction turbine?
(A) Pelton
(B) Kaplan
(C) Impulse turbine
(D) None of the above

182. Which of the following is a dimensionless number used in open channel flow analysis?
(A) Reynolds number
(B) Froude number
(C) Weber number
(D) Euler number

183. Which of the following is NOT an advantage of drip irrigation?
(A) Water conservation
(B) Reduction in weed growth
(C) High initial cost
(D) Uniform water distribution

184. The term "Cusec" is used to measure
(A) Velocity of water
(B) Discharge of water
(C) Depth of water
(D) Temperature of water

185. What is the critical Reynolds number for laminar flow in a pipe?
(A) 1000
(B) 2000
(C) 4000
(D) 500

186. Which of the following is the value of limiting gradient for road to be constructed in mountainous terrain?
(A) 1 in 20
(B) 1 in 16.7
(C) 1 in 14.3
(D) 1 in 12.5

187. What is the length of engineer chain ?
(A) 50 ft
(B) 66 ft
(C) 100 ft
(D) 120 ft

188. The length of safe overtaking sight distance for one-way traffic road is 200 m. Estimate the desirable length of overtaking zone for the one-way traffic road.
(A) 1000 m
(B) 1100 m
(C) 1200 m
(D) 1300 m

189. The speed of overtaking vehicle on two-way road is 24.5 m/s. The time taken in overtaking operation is 6 sec. The reaction time of driver for overtaking is 2.0 sec. Calculate the safe overtaking sight distance for two-way road.
(A) 345 m
(B) 347 m
(C) 349 m
(D) 351 m

190. The speed of overtaking vehicles one-way road is 24.5 m/s. The time taken in overtaking operation is 6 sec. The reaction time for overtaking is 2.0 sec. Estimate the desirable length of overtaking zone for the one-way road.

(A) 1000 m
(B) 1050 m
(C) 1100 m
(D) 1200 m

191. Which of the following equation is used for the estimation of length summit curve for overtaking sight distance when L > OSD?

(A) $\frac{N*S^2}{4.4}$
(B) $\frac{N*S^2}{9.6}$
(C) $2S - \frac{9.6}{N}$
(D) $2S - \frac{4.4}{N}$

192. The pressure corresponding to which of the following settlement value is used for the estimation of modulus of subgrade reaction?

(A) 0.125 cm
(B) 0.135 cm
(C) 0.145 cm
(D) 0.175 cm

193. The extra widening required on a two-lane road having a horizontal curve of radius 100 m is 1.36 m. The longest wheel base of vehicle expected on the road is 6.0 m. Estimate the design speed.

(A) 95 kmph
(B) 105 kmph
(C) 115 kmph
(D) 125 kmph

194. Which of the following is the width of carriageway for two-lane road with raised kerb?

(A) 5.5 m
(B) 6.75 m
(C) 7.0 m
(D) 7.5 m

195. The allowable rate of introduction of superelevation (pavement rotated about the center line) is 1 in 150. The pavement width including extra width is 7.5 m. Calculate the length of transition curve by assuming a safe superelevation rate of 0.07.

(A) 38.38 m
(B) 39.38 m
(C) 40.38 m
(D) 41.38 m

196. The mean speed on a roadway is found to be 90 kmph. Under stopped condition the average spacing between vehicles is 5.0 m. Determine the capacity of flow.

(A) 4100 veh/hr
(B) 4300 veh/hr
(C) 4500 veh/hr
(D) 4700 veh/hr

197. The average journey time of test vehicle travelling with the stream is 0.025 hr. The average journey time during trips against the stream is 0.025 hr. Given that the number of vehicles encountered in the stream while the test vehicle was moving against the traffic stream is 107, number of vehicles that had overtaken the test vehicle is 10, and the number of vehicles overtaken by the test vehicle is 74. The mean speed of the stream is 5 km/hr. Find the density of the stream.

(A) 170 veh/km
(B) 172 veh/km
(C) 174 veh/km
(D) 176 veh/km

198. The average normal flow of traffic on cross roads A and B during design period are 500 and 300 pcu per hour respectively. The corresponding saturation flow is 1600 pcu per hour on each road. The all-red time required for pedestrian crossing is 10 secs. Estimate the optimum signal cycle length.

(A) 46 sec
(B) 48 sec
(C) 50 sec
(D) 52 sec

199. The length of transition curve as per allowable rate of centrifugal acceleration is 48 m. The length of transition curve as per the rate of introduction of superelevation is 40 m. The length of transition curve as per the IRC empirical formula is 60 m. The radius of circular curve is 250 m. Estimate the value of shift.

(A) 0.54 m
(B) 0.56 m
(C) 0.58 m
(D) 0.60 m

200. Which one of the following correctly represents the specification of 'STOP' sign?

(A) Octagonal shape, red in colour with white border
(B) Triangular shape, red in colour with white border
(C) Octagonal shape, white in colour with red border
(D) Triangular shape, white in colour with red border