Engineering Services (P)
Examination - 2025

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T.B.C. : ASNP–T–CVLE **Test Booklet Series**

A

Serial No. 1031925

TEST BOOKLET

CIVIL ENGINEERING

Time Allowed : Three Hours **Maximum Marks : 300**

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET *DOES NOT* HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the Answer Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. *DO NOT* write *anything else* on the Test Booklet.
4. This Test Booklet contains **150** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose *ONLY ONE* response for each item.
5. You have to mark all your responses *ONLY* on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. ***All*** items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong answers :**
    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.
    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to that question will be deducted as penalty.
    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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1. 'Rind gall' of sapwood is characterized by

   (a) longitudinal cracks normal to annular rings

   (b) swelling caused by growth of layers over wounds after the branch has been cut off in an irregular manner

   (c) wood with twisted fibers

   (d) discoloration

2. Which one of the following is correct with respect to incident in the context of construction safety?

   (a) Dangerous or unpleasant situation from which someone just manages to escape

   (b) Disruption in the normal or smooth flow of work that involves an injury, property loss, damaged equipment, work stoppage, etc.

   (c) Unsafe physical condition that could lead to an injury, accident, or loss

   (d) Potential for loss resulting from a given action, activity or inaction

3. For a concrete mix design, an estimation of water content corresponds to

   (a) oven-dried aggregates

   (b) saturated surface dry aggregates

   (c) air-dried aggregates

   (d) wet aggregates

4. For maximum strength, the desired workability of fresh concrete can be attained by which one of the following measures?

   (a) The proportion of coarse aggregate may be increased

   (b) The proportion of fine aggregate may be reduced

   (c) The process of mixing concrete can be repeated second time by the use of vibrators

   (d) The quantity of cement may be increased while quantity of water may be reduced

5. Plywoods are classified as Boiling Water Resistant (BWR) grade and Moisture Resistant (MR) grade depending on

   (a) appearance of surface

   (b) thickness of plywood

   (c) density of plywood

   (d) bond strength developed by adhesive used for bonding the veneers

6. High percentage presence of free silica in lime exhibits

   (a) good cementing and quick setting properties

   (b) high strength and cementing properties

   (c) good cementing and hydraulic properties

   (d) poor cementing and hydraulic properties

7. Which one of the following is the correct sequence in increasing order for the chemical composition of Portland cement?

   (a) Fe_2O_3, Al_2O_3, SiO_2, CaO

   (b) Al_2O_3, Fe_2O_3, SiO_2, CaO

   (c) Fe_2O_3, Al_2O_3, CaO, SiO_2

   (d) Al_2O_3, SiO_2, Fe_2O_3, CaO

8. As per the straight line method, what is the annual depreciation value of an equipment that has delivered price of ₹1,00,000 and has a residual value of 10% of delivered price? Assume the ownership period as 5 years.

(a) ₹18,000/year

(b) ₹2,000/year

(c) ₹20,000/year

(d) ₹9,000/year

9. Sugar added to cement mortar

(a) accelerates setting time and destroys the early strength

(b) delays setting time and destroys the early strength

(c) accelerates setting time and increases the early strength

(d) delays setting time and increases the early strength

10. Which one of the following is ***not*** the correct characteristic of an ideal mortar?

(a) Develops good adhesion with building unit such as bricks and stones

(b) Withstands the stresses developed

(c) Offers less resistance to water penetration

(d) Durability

11. Surkhi is added to lime mortar for furnishing

(a) hydraulic properties

(b) adhesive properties

(c) solubility properties

(d) cohesive properties

12. A power plant has a stack with a diameter of 2 m and emits gases with a stack exit velocity of 15 m/s and a heat emission rate of 4900 kJ/s. The wind speed is 5 m/s. Stability is neutral. If the stack has a geometric height of 40 m, what is the effective stack height, nearly?

(a) 40 m (b) 60 m

(c) 80 m (d) 100 m

13. A steel punch can be stressed to maximum compressive stress of 800 MN/m^2. If the ultimate shear strength is 300 MN/m^2, the least diameter of the hole that can be punched through a steel plate of 14 mm thickness will be

(a) 41 mm (b) 31 mm

(c) 21 mm (d) 11 mm

14. A bar of 2500 mm^2 cross-sectional area is subjected to an axial load of 150 kN. The extension over a gauge length of 100 mm is 0·05 mm. If the decrease in each side is 0·00625 mm, the value of Poisson's ratio is

(a) $\frac{1}{5}$ (b) $\frac{1}{4}$

(c) $\frac{1}{3}$ (d) $\frac{1}{2}$

15. The resilience in simple tension or compression is

(a) $\frac{\sigma^2}{2E}$ (b) $\frac{\sigma^2}{2A}$

(c) $\frac{\sigma^2}{2AE}$ (d) $\frac{2\sigma^2}{AE}$

where σ is tensile or compressive stress, A is area of cross-section and E is modulus of elasticity.

16. Consider the following data :

Weight of a dish = 48·6212 g

100 mL of sample is placed in the dish and evaporated. The new weight of the dish and dry solids = 48·6432 g

The dish is placed in a 550 °C furnace, then cooled. New weight = 48·6300 g

In this case, the total volatile solids are

(a) 132 mg/L

(b) 220 mg/L

(c) 88 mg/L

(d) 308 mg/L

17. The radius of the Mohr's circle of stress is

(a) $\sqrt{\left(\frac{\sigma_x + \sigma_y}{2}\right)^2 - \tau^2}$

(b) $\sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau^2}$

(c) $\sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 - \tau^2}$

(d) $\sqrt{\left(\frac{\sigma_x + \sigma_y}{2}\right)^2 + \tau^2}$

where σ_x and σ_y are normal stresses, and τ is shear stress.

18. Which one of the following statements is ***not*** correct regarding theories of failure?

(a) The cause of failure depends on the properties of the material.

(b) In case of brittle materials, the maximum principal stress theory should be used.

(c) For ductile materials, the maximum shear stress theory gives good approximation.

(d) The cause of failure is not dependent on the stress system to which it is subjected.

19. The principal stresses at a point in an elastic material are 2σ tensile and σ tensile. If an elastic limit in simple tension is 200 N/mm^2, according to the maximum principal stress theory, the value of σ at failure will be

(a) 108 N/mm^2

(b) 100 N/mm^2

(c) 90 N/mm^2

(d) 80 N/mm^2

20. In case of simple tension or compression, the maximum shear stress is equal to

(a) the applied stress and acts on planes at 45° to it

(b) one-half the applied stress and acts on planes at 45° to it

(c) the applied stress and acts on planes at 60° to it

(d) one-half the applied stress and acts on planes at 60° to it

21. For a general two-dimensional stress system, the maximum principal stress σ_1 is

(a) $\frac{\sigma_x + \sigma_y}{2} - \sqrt{\left(\frac{\sigma_x + \sigma_y}{2}\right)^2 + \tau_{xy}^2}$

(b) $\frac{\sigma_x + \sigma_y}{2} + \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 - \tau_{xy}^2}$

(c) $\frac{\sigma_x + \sigma_y}{2} - \sqrt{\left(\frac{\sigma_x + \sigma_y}{2}\right)^2 - \tau_{xy}^2}$

(d) $\frac{\sigma_x + \sigma_y}{2} + \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$

where σ_x and σ_y are direct stresses on mutually perpendicular planes and τ_{xy} is shear stress on planes.

22. On a principal plane, the value of shear stress is

(a) half of principal stress

(b) maximum

(c) zero

(d) equal to principal stress

23. A circular log of timber has diameter d. The ratio of breadth b to depth h ($b : h$) of the rectangular beam that can be cut from a circular log for strongest section in bending is

(a) $1 : 1$ *(b)* $1 : \sqrt{2}$

(c) $1 : \sqrt{3}$ *(d)* $1 : 2$

24. The torsional stiffness k is given by the relation

(a) $k = \dfrac{GJ}{l}$ *(b)* $k = \dfrac{Gl}{J}$

(c) $k = \dfrac{lJ}{G}$ *(d)* $k = \dfrac{GJ}{l^2}$

where G is rigidity modulus, J is polar moment of inertia and l is length.

25. A cast iron main tube 800 mm in diameter carries water at pressure head of 100 m. If the maximum permissible tensile stress is 20 MN/m^2 and the weight of water is 10 kN/m^3, the required thickness of the metal will be

(a) 5 mm *(b)* 10 mm

(c) 15 mm *(d)* 20 mm

26. A cylindrical air drum is 2·25 m in diameter with plates 1·2 cm thick. The efficiencies of the longitudinal and circumferential joints are 75% and 40% respectively. If the tensile stress in the plate is limited to 120 MN/m^2, the safe maximum air pressure will be

(a) 0·84 MN/m^2

(b) 0·96 MN/m^2

(c) 1·02 MN/m^2

(d) 1·56 MN/m^2

27. The maximum shear stress τ_{max} for a beam of circular section is

(a) $\dfrac{5V}{3A}$ *(b)* $\dfrac{3V}{4A}$

(c) $\dfrac{3V}{5A}$ *(d)* $\dfrac{4V}{3A}$

where A is cross-sectional area and V is shear force.

28. Consider a rectangular hollow section having overall width B and overall depth D, and let the width and depth of the symmetrically placed hole be b and d respectively. Then the section modulus (Z) is

(a) $\dfrac{(BD^3 - bd^3)}{6d}$

(b) $\dfrac{(BD^3 - bd^3)}{12D}$

(c) $\dfrac{(BD^3 - bd^3)}{12d}$

(d) $\dfrac{(BD^3 - bd^3)}{6D}$

29. A long rectangular wall is 2·5 m wide. The maximum wind pressure on the face of wall is 1·1 kN/m^2 and the specific weight of masonry is 22 kN/m^3. If the length of the wall is 1 m, the maximum height of the wall so that there is no tension in the base of the wall will be nearly

(a) 52 m *(b)* 42 m

(c) 32 m *(d)* 22 m

30. A fixed beam of span l is subjected to a central concentrated load W. The bending moment at the supports will be

(a) $\dfrac{Wl}{4}$ *(b)* $\dfrac{Wl}{8}$

(c) $\dfrac{Wl^2}{4}$ *(d)* $\dfrac{Wl^2}{8}$

31. In a fixed beam subjected to downward loads, the maximum bending moment is given by the greater fixing moment. This is true

(a) if load is only central point load

(b) if load is only eccentric point load

(c) if load is only distributed load

(d) for any combination of downward loads

32. The deflection δ at the free end of a cantilever is

(a) $\frac{PL^2}{2EI}$

(b) $\frac{PL^3}{3EI}$

(c) $\frac{PL^3}{2EI}$

(d) $\frac{PL^2}{3EI}$

where P is point load at the free end, EI is flexural rigidity and L is length of the cantilever.

33. A cantilever beam of span L is subjected to uniformly distributed load of intensity W. If the flexural rigidity is EI, the slope θ and deflection δ at the free end are respectively

(a) $-\frac{WL^3}{8EI}$ and $-\frac{WL^4}{8EI}$

(b) $-\frac{WL^3}{6EI}$ and $-\frac{WL^4}{6EI}$

(c) $-\frac{WL^3}{8EI}$ and $-\frac{WL^4}{6EI}$

(d) $-\frac{WL^3}{6EI}$ and $-\frac{WL^4}{8EI}$

34. The strain energy U due to bending is

(a) $\int\left(\frac{M^2.dx}{2EI}\right)$

(b) $\int\left(\frac{M.dx}{3EI}\right)^2$

(c) $\int\left(\frac{M^2.dx}{3EI}\right)$

(d) $\int\left(\frac{M.dx}{2EI}\right)^2$

where M is bending moment, EI is flexural rigidity and dx is short length of beam.

35. A rectangular beam 150 mm × 240 mm deep is simply supported at the ends on a span of 4 m and carries a uniformly distributed load of 4 kN/m on the whole span. What is the point load at the centre it should carry so that the maximum deflection is doubled?

(a) 24 kN *(b)* 20 kN

(c) 16 kN *(d)* 12 kN

36. When a cable is passed over a pulley on the pier and is stayed at the back, the pier will be subjected to net horizontal force which is given by

(a) $H(1-\sin\alpha\cdot\operatorname{cosec}\beta)$

(b) $H(1-\sin\beta\cdot\operatorname{cosec}\alpha)$

(c) $H(1+\sin\alpha\cdot\operatorname{cosec}\beta)$

(d) $H(1+\sin\beta\cdot\operatorname{cosec}\alpha)$

where H is horizontal tension in the cable, α is angle made by the cable with vertical and β is angle made by the backstay with vertical at pier.

37. Which one of the following statements is ***not*** correct?

(a) In elastic theory of design, stresses in the structures under working load are less than the allowable working stress.

(b) Theory of elasticity will be best suited for structural analysis at the time of failure.

(c) Elastic method does not provide a uniform overload capacity for all parts of the structures.

(d) The ultimate load design method is more economical than elastic design method.

38. A steel chimney 3 m in diameter is situated in a region where the intensity of uniform wind pressure is 1200 N/m^2. If the shape factor is 0·7 and the intensity of wind pressure is uniform, the shear due to wind load at a level of 15 m below the top of the chimney will be

(a) 37·8 kN

(b) 34·6 kN

(c) 31·8 kN

(d) 27·6 kN

39. With regard to beams in structure, what are joists?

(a) Usually indicate a major beam frequently at wide spacing that supports small beams

(b) Closely spaced beams supporting the floors and roofs of building

(c) Roof beams usually supported by trusses

(d) Roof beams usually supported by purlins

40. The design strength of a tension member due to the net section rupture for plates and threaded rods is

(a) $\frac{1{\cdot}2A_n f_u}{\gamma_{ml}}$

(b) $\frac{0{\cdot}9A_n f_u}{\gamma_{ml}}$

(c) $\frac{0{\cdot}6A_n f_u}{\gamma_{ml}}$

(d) $\frac{0{\cdot}3A_n f_u}{\gamma_{ml}}$

where A_n is net effective area of cross-section, f_u is ultimate strength of the material and γ_{ml} is partial safety factor.

41. Which one of the following checks is necessary in the design of uniaxial bending?

(a) $\frac{\sigma_{at,cal}}{0{\cdot}6f_y} + \frac{\sigma_{bt,cal}}{0{\cdot}66f_y} \leq 1{\cdot}0$

(b) $\frac{\sigma_{at,cal}}{0{\cdot}6f_y} - \frac{\sigma_{bt,cal}}{0{\cdot}66f_y} \leq 1{\cdot}0$

(c) $\frac{\sigma_{at,cal}}{0{\cdot}6f_y} + \frac{\sigma_{bt,cal}}{0{\cdot}66f_y} \geq 1{\cdot}0$

(d) $\frac{\sigma_{at,cal}}{0{\cdot}6f_y} - \frac{\sigma_{bt,cal}}{0{\cdot}66f_y} \geq 1{\cdot}0$

42. The maximum slenderness ratio λ for a member normally acting as a tie in a roof truss or a bracing system, but subject to possible reversal of stresses resulting from the action of wind or earthquake forces is

(a) 430

(b) 350

(c) 250

(d) 180

43. The permissible maximum shear stress τ_{vm} for a steel beam should not exceed

(a) $0{\cdot}36f_y$

(b) $0{\cdot}45f_y$

(c) $0{\cdot}65f_y$

(d) $0{\cdot}87f_y$

where f_y is yield stress of steel.

44. As per IS 800 : 2007, the recommended value of an effective length for compression members of constant dimensions effectively held in position at both ends, but not restrained against rotation, is

(a) $1{\cdot}00L$

(b) $1{\cdot}20L$

(c) $1{\cdot}50L$

(d) $2{\cdot}00L$

45. Which one of the following is applicable in case of analysis of portal bracing?

(a) Portal bracings are provided at one end of the truss girder bridge in the plane of end posts

(b) In addition to the lateral force due to wind, the bracings are also designed to carry a lateral shear equal to $1\frac{1}{4}$ percent of the total compressive force in two end posts

(c) The maximum wind load of loaded span is taken into consideration

(d) Portal bracings are generally provided in more than one plane, located anywhere except in the central transverse plane of end posts

46. The buckling of the web by diagonal compression can be prevented by which of the following?

1. The depth to thickness ratio of web can be increased
2. Web stiffness may be provided forming panels to increase the shear resistance of the web
3. Web stiffness may be provided forming panels in such a way as to create tension field action in the web to resist diagonal compression

Select the correct answer.

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

47. It is proposed to design an industrial building 12 m high for a 50-year life. The building size is in the range 20 m to 50 m, the topography of the site is practically plain and the terrain is in the city industrial area. If the risk coefficient $k_1 = 1$, terrain factor $k_2 = 0{\cdot}9$, topography factor $k_3 = 1$ and wind speed $V_b = 47$ m/s, the design wind pressure at the site will be nearly

(a) 0·6 kN/m^2

(b) 1·1 kN/m^2

(c) 2·1 kN/m^2

(d) 2·6 kN/m^2

48. The ultimate tensile strain in steel is

(a) 5–15 times more strain than concrete at collapse

(b) 15–25 times more strain than concrete at collapse

(c) 25–35 times more strain than concrete at collapse

(d) 35–45 times more strain than concrete at collapse

49. The long-term deflections of reinforced concrete members under sustained loads are mainly due to

1. differential shrinkage
2. creep under sustained loading
3. temperature effects

Select the correct answer.

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

50. The maximum spacing of vertical stirrups at beam ends (plastic hinge locations) as per IS 13920 is the lesser of

(a) 0·75d or 300 mm

(b) 0·55d or 250 mm

(c) 0·35d or 200 mm

(d) 0·15d or 150 mm

51. Which of the following are the design steps of restrained slabs?

1. Slabs are considered as divided in each direction into middle strips and edge strips
2. The middle strips are one-fourth of the width and edge strips are three-quarters of the width
3. Tension reinforcement provided at mid-span in the middle strip shall extend in lower part of the slab to within $0{\cdot}25l$ of continuous edge or $0{\cdot}15l$ of a discontinuous edge, where l is the length of the span

Select the correct answer.

(a) 1 and 3 only

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1, 2 and 3

52. Which of the following are the correct design requirements regarding underground water tanks?

1. Walls are to be designed for saturated soil up to the extent of water above the base slab
2. Base slab is to be designed for the net uplift pressure of water (less weight of slab for tank empty)
3. Check has to be applied for stability of the tank as a whole against uplift

Select the correct answer.

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

53. Which of the following characteristics are useful in the yield line patterns for slab with various boundary conditions?

1. Yield lines are curvilinear lines so that they may act as plastic hinges
2. Yield lines terminate at the slab boundary or at intersection of other yield lines
3. Yield lines may form along the support if an edge is fixed or continuous

Select the correct answer.

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

54. For cohesionless sand at a depth of 6 m and with an angle of internal friction of 30°, the active lateral pressure intensity will be (take unit weight of dry sand as 19600 N/m^3)

(a) 43·4 kN/m^2

(b) 39·2 kN/m^2

(c) 36·4 kN/m^2

(d) 33·2 kN/m^2

55. A slab having total thickness 120 mm is provided reinforcement bars of following diameters. The permissible diameter is

(a) 15 mm

(b) 16 mm

(c) 18 mm

(d) 19 mm

56. The correct sequence of the stages for dressing of stone is

(a) planning, sizing, shaping, finishing, polishing

(b) sizing, planning, shaping, finishing, polishing

(c) planning, shaping, sizing, finishing, polishing

(d) sizing, shaping, planning, finishing, polishing

57. The short-term static modulus of elasticity E_C for structural concrete defining the slope of the tangent to the stress-strain diagram may be estimated from

(a) $2000\sqrt{f_{ck}}$ MPa

(b) $3000\sqrt{f_{ck}}$ MPa

(c) $4000\sqrt{f_{ck}}$ MPa

(d) $5000\sqrt{f_{ck}}$ MPa

where f_{ck} is the characteristic compressive strength of concrete.

58. The stone masonry construction is superior to brick masonry construction under which of the following circumstances?

1. Stone masonry construction can be developed aesthetically more sound than brickwork
2. Stone masonry is more watertight than brick masonry, because of the fact that bricks absorb moistures from the atmosphere
3. For public buildings and monumental structures, stone masonry provides a solid appearance and is found to be more useful than brick masonry

Select the correct answer.

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

59. Consider the following statements :

The wall thickness depends upon

1. the anticipated load to come on the wall
2. the quality of wall material
3. the overall height of the wall
4. the height between floors
5. the spacing between buttress and cross-wall

Which of the above statements are correct?

(a) 1, 2, 3, 4 and 5

(b) 1, 2, 3 and 4 only

(c) 1, 2, 3 and 5 only

(d) 2, 3, 4 and 5 only

60. Grader may be used for the following works, ***except***

(a) finishing or levelling earthwork

(b) shaping bank slopes

(c) heavy excavation

(d) dirt road maintenance

61. What is the time required to grade and finish 30 km of road formation with width equal to thrice the width of the motor grader, using six passes of the motor grader with speed for each of the successive two passes as 6 km/hr, 8 km/hr and 10 km/hr respectively? Assume machine efficiency based on operator's skill, machine characteristics and work conditions as 75%.

(a) 78 hours

(b) 84 hours

(c) 90 hours

(d) 96 hours

62. The factors influencing the output of a machine in construction are

1. physical site conditions
2. condition of the machine
3. method of operation
4. type of soil

Which of the above factors are correct?

(a) 1, 2 and 3 only

(b) 1, 2 and 4 only

(c) 2, 3 and 4 only

(d) 1, 2, 3 and 4

63. Which one of the following statements is ***not*** correct in respect of network diagram for time scheduling techniques?

(a) In a network, there must be only a single node and the initial node must have only outgoing arrows.

(b) A network can have more than one final node.

(c) An event cannot occur twice, i.e., there cannot be any network path looping back to previously occurred event.

(d) An event cannot occur until all the activities leading to it are completed.

64. An interference float is defined as

(a) the amount of time by which the start of the activity may be delayed without causing a delay in the completion of the project

(b) the amount of time by which the start of the activity may be delayed without delaying start of a following activity

(c) the difference between total float and free float

(d) the amount of time by which the start of the activity may be delayed without affecting the preceding or the following activity

65. What is the approximate efficiency of a Kaplan turbine developing 3000 kW under a net head of 5 m? It is provided with a draft tube with its inlet (diameter 3 m) set 1·6 m above the tailrace level. A vacuum gauge connected to the draft tube indicates a reading of 5 m of water. Assume draft tube efficiency as 68% and acceleration due to gravity as $10\ m/s^2$. Neglect head losses in draft tube.

(a) 85%

(b) 90%

(c) 80%

(d) 95%

66. Any cause which is beyond the control of the contractor or the owner, as the case may be, which they could not foresee or a reasonable amount of diligence could not have foreseen and which substantially affects the performance of the contract, is called

(a) letter of intent

(b) liquidated damage

(c) force majeure

(d) warranty period

67. A point beyond which the project duration cannot be reduced irrespective of the increase in direct cost is known as

(a) normal duration

(b) optimum duration

(c) pessimistic duration

(d) crash duration

68. Which one of the following models has ***not*** been found to be of much practical value in the construction industry?

(a) Game theory model

(b) Friedman's model

(c) Gates model

(d) Cash flow-based model

69. Which one of the following reasons is ***not*** correct for low labour productivity?

(a) Unproductive time

(b) Workers high morale

(c) Poor pre-work preparation by supervisors

(d) Directional failures of the project management

70. Consider the following basic causes of accidents in civil engineering works :

1. Persons/materials falling from height
2. Persons being struck or trapped by moving objects
3. Persons stepping on or striking against objects

Which of the above causes are correct?

(a) 1, 2 and 3

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1 and 3 only

71. Which one of the following Acts covers provision for daily working hours, holidays and overtime payments?

(a) The Minimum Wages Act

(b) The Payment of Wages Act

(c) The Factories Act

(d) The Trade Unions Act

72. What is the depth of a point below water surface in sea where pressure intensity is $1{\cdot}006\ MN/m^2$ and the specific gravity of seawater is 1·025?

(a) 70 m

(b) 80 m

(c) 90 m

(d) 100 m

73. Which one of the following pressure gauges is most accurate device and is used for precision work and calibrating other pressure gauges?

(a) Deadweight pressure gauge

(b) Diaphragm pressure gauge

(c) Bourdon tube pressure gauge

(d) Vacuum pressure gauge

74. Water is flowing through a pipe of 5 cm diameter under a pressure of $29{\cdot}43\ N/cm^2$ (gauge) and with mean velocity of 2 m/s. What is the total head of the water at a cross-section, which is 5 m above the datum line? Take the density of water as $1000\ kg/m^3$.

(a) 38·2 m

(b) 35·2 m

(c) 32·6 m

(d) 28·6 m

75. Pitot tube is one of the most accurate devices for

(a) pressure measurement

(b) velocity measurement

(c) density measurement

(d) surface tension measurement

76. A circular disc 3 m in diameter is held normal to a 26·4 m/s wind of density 1·2 kg/m^3. If the coefficient of drag of disc is 1·1, the force required to hold it at rest will be nearly

(a) 1·25 kN

(b) 2·5 kN

(c) 3·25 kN

(d) 4·2 kN

77. The phenomenon of sudden rise in pressure in the pipe is known as

(a) pressure rise

(b) water hammer

(c) stream function

(d) hydraulic gradient

78. What is the discharge through the venturi flume built in a rectangular channel 1 m wide and having its throat width 0·4 m? The upstream head is 0·57 m, measured head in throat is 0·5 m and the value of C_d is 1.

(a) 210 L/s

(b) 230 L/s

(c) 250 L/s

(d) 270 L/s

79. In a long pipe, when the flowing water is suddenly brought to rest by closing the valve or by any similar cause, there will be a sudden rise in pressure. The magnitude of pressure rise depends on

(a) the speed at which the valve is opened

(b) the velocity of flow

(c) the diameter of the pipe

(d) the thickness of the pipe wall

80. A spherical object of 1·45 m diameter is completely immersed in a water reservoir and chained to the bottom. If the chain has a tension of 5·2 kN, the weight of the object when it is taken out of the reservoir into the air will be nearly

(a) 15·5 kN *(b)* 12·5 kN

(c) 10·5 kN *(d)* 7·5 kN

81. A double-acting reciprocating pump having piston area 0·1 m^2 has a stroke 0·30 m long. If the pump is discharging 2·4 m^3 of water per minute at 45 r.p.m. through a height of 10 m, the power required to drive the pump will be nearly

(a) 4·98 kW *(b)* 4·86 kW

(c) 4·64 kW *(d)* 4·42 kW

82. A centrifugal pump is required to lift water to a total head of 40 m at the rate of 50 L/s. If its overall efficiency is 62%, the power required for the pump will be

(a) 25·6 kW *(b)* 28·4 kW

(c) 31·6 kW *(d)* 34·4 kW

83. Full load is supplied by the turbine shaft when the diameter of jet issuing from the nozzle is 150 mm. If the load suddenly drops to 36% of the full load, the jet diameter to regulate the speed will be

(a) 75 mm

(b) 80 mm

(c) 85 mm

(d) 90 mm

84. What is the delta for a crop when its duty is 864 hectares/cumec on the field (the base period of this crop is 120 days)?

(a) 100 cm

(b) 110 cm

(c) 120 cm

(d) 130 cm

85. Formation of successive bends of reverse order may lead to the formation of a complete 'S' curve called

(a) bending

(b) meander

(c) silting

(d) scouring

86. Which one of the following is the pre-construction measure for silting control in reservoirs?

(a) Construction of check dams

(b) Removal of post-flood water

(c) Mechanical stirring of the sediment

(d) Erosion control and soil conservation

87. Which one of the following is a simple and straight forward analytical procedure for computing reservoir capacity and is used as an excellent alternative to mass curve method of determining reservoir capacity?

(a) Sequent peak algorithm

(b) Inflow method

(c) Cumulative inflow

(d) First peak

88. Which one of the following rivers is a silting river?

(a) Aggrading river

(b) Degrading river

(c) Stable type river

(d) Braided river

89. Rivers in alluvial flood plains which flow in zig-zag fashion are called

(a) meandering

(b) aggrading

(c) degrading

(d) deltaic

90. All the methods of calculating crop evapotranspiration involve which one of the following relationships?

(a) $ET_c = 2K_c ET_o$

(b) $ET_c = K_c ET_o$

(c) $ET_c = 4K_c ET_o$

(d) $ET_c = \frac{K_c}{ET_o}$

where K_c is crop coefficient, ET_o is potential evapotranspiration and ET_c is evapotranspiration of a specific crop.

91. Which one of the following data is ***not*** required for design of a weir or a barrage?

(a) High flood level for the river at the weir site

(b) Maximum flood discharge for the river at the weir site

(c) River cross-section at the weir site

(d) Discharge of the river

92. In case of design of a weir or a barrage by providing a higher afflux, the waterway and, therefore, the length of the weir can be reduced, but it will result in

(a) increased cost of training works

(b) reduced risk of failure by outflanking

(c) reduced scour

(d) reduced discharge intensity

93. In case of irrigation canal, the seepage losses depend upon

(a) the condition of the canal; the seepage through a silted canal is more than that from a new canal

(b) amount of silt carried by the canal; the less the silt, lesser are the losses

(c) velocity of canal water; the more the velocity, the more will be the losses

(d) cross-section of the canal and its wetted perimeter

94. Which one of the following is ***not*** the way of alignment of canals?

(a) Watershed canal

(b) Contour canal

(c) Distribution canal

(d) Side slope canal

95. Which one of the following is one of the objectives of the river training?

(a) To make the river change its course

(b) To protect the river banks by deflecting the river away from the attacked banks

(c) To avoid disposal of sediment load

(d) To avoid providing minimum water depth required for navigation

96. While laying or designing the water distribution system, attempts should be made to keep the

(a) sewer lines and waterlines as far away as possible

(b) sewer lines above the waterlines

(c) sewer lines exactly below the waterlines

(d) sewer lines and waterlines close to each other

97. Which one of the following factors should be kept in view while fixing the design period for waterworks?

(a) Funds available for the completion of the project; if more funds are available, the design period shall be more

(b) Life of the pipe and other structural materials used in the water supply scheme

(c) As far as possible the design period should be longer than life of materials used in the water supply scheme

(d) Rate of interest on the loans taken to complete the project; if it is more, it will be good to keep design period more

98. Which one of the following is the function of the Central Board set up by the Government of India for water pollution prevention?

(a) To carry out the river surveys for classification

(b) To help and provide research facilities in connection with the water pollution control

(c) To provide and arrange training facilities to the people connected with the water pollution control

(d) To lay down the water purification standards

99. Which of the following measures is/are to be adopted against the water pollution?

1. The sewage before discharging into the water body may need not be treated
2. The industrial waste should not be treated before disposing it off
3. As far as possible water sources should not be used for discharging the sewage

Select the correct answer.

(a) 1, 2 and 3

(b) 1 only

(c) 3 only

(d) 1 and 2 only

100. Which one of the following is one of the objects of water treatment?

(a) To detect the dissolved gases, murkiness and colour of water

(b) To detect the pleasant and objectionable tastes of water

(c) To kill all the pathogenic germs, which are harmful to the human health

(d) To detect the tuberculating and corrosive properties of water

101. Which one of the following aspects should be considered at the time of final selection of sewage treatment plant?

(a) The site should be safe from floods for all the time

(b) The site should not be situated on the leeward side of wind

(c) The site should be as far as possible far away from the town

(d) The subsoil water level at the site should not remain low even during monsoon

102. A completely mixed activated process is to be used to treat wastewater flow of 500 m^3/hr having soluble BOD_5 of 250 mg/L. If the concentration of soluble BOD_5 escaping treatment is 10 mg/L, the treatment efficiency will be

(a) 82%

(b) 86%

(c) 92%

(d) 96%

103. The land treatment of sewage is suitable, when

(a) the overall rainfall is very high

(b) there is no river or natural water course

(c) the quantity of sewage is less

(d) rivers usually run full during summer

104. The excessive acidity or alkalinity of the particular wastewater is neutralized by adding alkali or acid and this is achieved in

(a) the sedimentation tank

(b) the equalization tank

(c) the flocculation tank

(d) the purification tank

105. Which one of the following is an aerobic method of decomposing solid waste?

(a) Sanitary landfill

(b) Composting

(c) Incineration

(d) Open dumping

106. Which one of the following lists identifies the wastes from common manufacturing and industrial process, such as solvents that have been used in cleaning or degreasing operations?

(a) The F-list

(b) The K-list

(c) The P-list

(d) The U-list

107. When once a pocket of smoke, containing air pollutants, is released into the atmosphere from a source like an automobile or a factory chimney, it gets dispersed into the atmosphere into various directions depending upon the

1. prevailing winds
2. temperature
3. pressure conditions

Select the correct answer.

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

108. During the compaction test, the weight of compacted soil specimen along with mould is 38·2 N. The volume and weight of mould are $0{\cdot}95 \times 10^{-3}$ m^3 and 20·5 N respectively and the water content is 12%. The dry unit weight of the compacted specimen will be nearly

(a) 16·6 kN/m^3

(b) 14·4 kN/m^3

(c) 12·6 kN/m^3

(d) 10·4 kN/m^3

109. Which one of the following is a time-dependent reversible process in which materials under constant composition and volume soften when remolded?

(a) Sensitivity

(b) Hydraulic conductivity

(c) Thixotropy

(d) Elasticity

110. The compressibility of a saturated, clay-water system is determined by means of the apparatus devised by Terzaghi known as

(a) Compressometer

(b) Oedometer

(c) Casagrande meter

(d) Azzouz meter

111. In a flow net for a sheet pile wall, the number of flow paths is 5 and the number of equipotential drops is 10. If the coefficient of permeability is 6×10^{-3} mm/s and the head is 4·5 m, the seepage under the wall will be nearly

(a) 1367 L/day

(b) 1223 L/day

(c) 1167 L/day

(d) 1023 L/day

112. Which of the following types of conventional tests will be conducted on clay soils to test the shearing strength?

(a) Undrained or quick tests

(b) Unconsolidated-quick tests

(c) Drained tests

(d) Consolidated-slow tests

113. Which of the following are the advantages of reinforced earth structures?

1. These are quite flexible
2. The elements can be transported easily
3. These can be constructed in stages
4. The elements used are not easily available

Select the correct answer.

(a) 1 and 2 only

(b) 2 and 4 only

(c) 1, 2 and 3

(d) 2, 3 and 4

114. The load on a square footing 2 m × 2 m resting on a deep deposit of clay is 600 kN. If the unconfined compressive strength of clay is 100 kN/m^2, the failure occurs at 20% of strain for Terzaghi's influence factor $I_t = 0{\cdot}95$, and Poisson's ratio of soil $\nu = 0{\cdot}5$, the average immediate settlement will be nearly

(a) 34 cm

(b) 43 cm

(c) 52 cm

(d) 61 cm

115. A well foundation of 6 m external diameter and of 5 m internal diameter is sunk to a depth of 15 m in a deep deposit of sand. If the average N value of sand is 20, the load that the well can carry by bearing alone will be nearly

(a) 52 MN

(b) 44 MN

(c) 38 MN

(d) 29 MN

116. A sheet pile wall or bulkhead may be subjected to which one of the following types of lateral pressures?

(a) Active and passive earth pressure

(b) Vertical pressure due to ship impact

(c) Balanced water pressure

(d) Inclined wind pressure

117. What is the maximum depth to which a trench of vertical sides can be excavated in a clay stratum with $c = 50\ kN/m^2$, $\gamma = 16\ kN/m^3$, $\beta = 90°$, $\phi = 0°$, $F_c = 1$ and $N = 0{\cdot}261$?

(a) 12 m

(b) 14 m

(c) 16 m

(d) 18 m

118. The reinforced soil technique/concept is essentially based on the mobilization of the interfacial shearing resistance between the soil and reinforcement which in turn restrains the

(a) shear force

(b) shearing resistance

(c) lateral deformation of the soil

(d) longitudinal deformation of the soil

119. Which one of the following is an example of reinforced earth wall?

(a) Facing panel with wire mesh reinforcement

(b) Hollow panel with tieback anchor

(c) Unanchored gabion wall

(d) PFRC wall

120. To keep the surveying instruments in fit condition

(a) the instrument should be removed from and placed quickly in the box

(b) the tripod legs should be set too close to each other and should be planted firmly on the ground

(c) when the magnetic needle of the instrument is in use, it should be raised off the pivot

(d) the objective and eyepiece lens should not be touched with fingers

121. The area of the plan of an old survey plotted to a scale of 15 m to 1 cm now measures as $80{\cdot}2\ cm^2$ as found by a planimeter. The plan is found to be shrunk, so that a line originally 10 cm long now measures 9·8 cm. The true area of the survey will be nearly

(a) $81{\cdot}5\ m^2$

(b) $83{\cdot}5\ m^2$

(c) $85{\cdot}5\ m^2$

(d) $87{\cdot}5\ m^2$

122. Magnetic declination at a place is

(a) the horizontal angle which a line makes with true meridian

(b) the horizontal angle which a line makes with the magnetic meridian

(c) the horizontal angle between the true meridian and the magnetic meridian

(d) the horizontal angle which a line makes with arbitrary meridian

123. The staff reading with a 4 m staff at a point *A* is 3·5 m. The top of the staff is 10 cm off the vertical through the bottom of the staff. If the staff is held vertically, the correct reading will be nearly

(a) 3·0 m

(b) 3·4 m

(c) 3·8 m

(d) 4·2 m

124. The circumpolar stars are having polar distances

(a) equal to the latitude of the place of the observation

(b) less than the latitude of the place of the observation

(c) twice the latitude of the place of the observation

(d) thrice the latitude of the place of the observation

125. In electromagnetic wave theory concept, the energy Q is

(a) $\frac{hc}{\lambda}$

(b) $\frac{\lambda c}{h}$

(c) $\frac{h}{\lambda c}$

(d) $\frac{\lambda h}{c}$

where h is Planck's constant, λ is wavelength and c is velocity.

126. Which one of the following statements is correct in case of map versus aerial photograph?

(a) Map is an orthogonal projection, whereas an aerial photograph is a central projection.

(b) Both a map and a photograph have constant scale.

(c) The amount of details both on a map and on an aerial photograph is selective.

(d) Due to symbolic representation, the clarity of details is more on a photo than on a map.

127. If the centrifugal ratio is given and comfort conditions hold good, the length of transition curve L for roads will be

(a) $16{\cdot}52\sqrt{R}$

(b) $12{\cdot}80\sqrt{R}$

(c) $8{\cdot}80\sqrt{R}$

(d) $4{\cdot}52\sqrt{R}$

where R is radius.

128. Which one of the following is an advantage for providing the transition curve on a road?

(a) It allows a sudden transition of curvature from the tangent to the circular curve

(b) The radius of curvature increases suddenly

(c) It is provided for the sudden change in superelevation

(d) It eliminates the danger of derailment, overturning or slide-slipping of vehicles and discomfort to passengers

129. A double-acting reciprocating pump, running at 40 r.p.m., is discharging 1·0 m^3 of water per minute. The pump has a stroke of 400 mm. The diameter of piston is 200 mm. The delivery and suction head are 20 m and 5 m respectively. The theoretical discharge for the double-acting pump is

(a) $\frac{1{\cdot}6\pi}{300}\ m^3/s$

(b) $\frac{0{\cdot}8\pi}{300}\ m^3/s$

(c) $\frac{2{\cdot}4\pi}{300}\ m^3/s$

(d) $\frac{0{\cdot}4\pi}{300}\ m^3/s$

130. The plunge of the fold is

(a) a line drawn parallel to the hinge line of a fold

(b) the angle of inclination of the fold axis with the horizontal as measured in a vertical plane

(c) a line representing the intersection of the axial plane of a fold with any bed of the fold

(d) a line drawn vertical to the hinge line of a fold

131. A transition curve should satisfy which of the following conditions?

1. It should meet the straight line part of the road tangentially

2. The length of it must be such that the cant or superelevation can be provided conveniently to its maximum value at the beginning of the circular curve

3. The rate of increase of the curvature should be such that it matches with the rate of increase of cant

Select the correct answer.

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

132. The total length L of valley transition curve for comfort condition is

(a) $2\left[\frac{Nv^3}{C}\right]^{\frac{1}{2}}$

(b) $\frac{1}{2}\left[\frac{Nv^2}{C}\right]^{\frac{1}{2}}$

(c) $2\left[\frac{Nv^2}{C}\right]^{\frac{1}{2}}$

(d) $\frac{1}{2}\left[\frac{Nv^3}{C}\right]^{\frac{1}{2}}$

where N is deviation angle, v is design speed and C is allowable rate of change of centrifugal acceleration.

133. For a roadway of 100 km/hr design speed, if the maximum allowable super-elevation rate is 0·12 and the maximum friction coefficient is 0·12, the minimum radius of curvature will be

(a) 328 m

(b) 304 m

(c) 288 m

(d) 264 m

134. The vertical stress σ_z under a uniformly distributed circular load based on Boussinesq's theory is

(a) $p\left[1-\frac{z^3}{(a^2+z^2)^{\frac{3}{2}}}\right]$

(b) $p\left[1+\frac{z^3}{(a^2+z^2)^{\frac{3}{2}}}\right]$

(c) $p\left[1-\frac{z^2}{(a^2+z^2)^{\frac{3}{2}}}\right]$

(d) $p\left[1+\frac{z^2}{(a^2+z^2)^{\frac{3}{2}}}\right]$

where p is surface pressure, z is depth at which σ_z is computed and a is radius of loaded area.

135. In the CBR method of pavement design, the mixed commercial vehicles with different axle loads are to be converted in terms of the cumulative number of standard axle load N_S, using the equation

(a) $N_S = \frac{365A[(1+r)^n - 1]}{r} \times F$

(b) $N_S = \frac{365A[(1+r)^n + 1]}{r} \times F$

(c) $N_S = \frac{365A[(1-r)^n - 1]}{r} \times F$

(d) $N_S = \frac{365A[(1-r)^n + 1]}{r} \times F$

where A is number of vehicles/day for completed construction for number of lanes, r is annual growth rate of commercial vehicles, n is design life of pavement and F is vehicle damage factor.

136. In a district where the rainfall is heavy, a major district road of WBM pavement, 3·8 m wide, is to be constructed. The height of the crown with respect to the edges is

(a) 0·058 m

(b) 0·072 m

(c) 0·064 m

(d) 0·049 m

137. If a crossover occurs between two MG parallel tracks of same crossing number 1 in 12 with straight intermediate portion between the reverse curves and the distance between the centres of the track is 3·5 m, the overall length of the crossover will be nearly

(a) 54 m

(b) 58 m

(c) 62 m

(d) 66 m

138. A transition curve of 90 m length is to be used to join the ends of 4° circular curve within straight and circular curve. The shift value and the offset value at 30 m are respectively, nearly

(a) 0·8 m and 11·6 cm

(b) 0·6 m and 11·6 cm

(c) 0·6 m and 15·4 cm

(d) 0·8 m and 15·4 cm

139. Which of the following is/are the correct reason(s) to provide the gradient on the railway track?

1. To provide moderate rise or fall
2. To reach the various stations located at different elevators
3. To reduce the cost of earthwork

Select the correct answer.

(a) 1 only

(b) 2 and 3 only

(c) 3 only

(d) 1, 2 and 3

140. An exit taxiway for an airport is to be designed. If the turnoff speed is 80 kmph and the coefficient of friction between tire and pavement surface is 0·13, the radius of the central curve will be nearly

(a) 354 m

(b) 372 m

(c) 394 m

(d) 422 m

141. Which of the following is/are the correct characteristic(s) of an ideal elastic fastening?

1. It should be able to maintain correct and uniform gauge
2. It should be of a very particular type
3. It shall offer elasticity of low level

Select the correct answer.

(a) 1 only

(b) 2 and 3 only

(c) 3 only

(d) 1, 2 and 3

142. Which of the following equipments are used for track recording by Indian Railways?

1. Track recording trolley
2. Track recording car
3. Rail-flaw detector
4. Hallade track recorder

Select the correct answer.

(a) 1, 2, 3 and 4

(b) 2 and 3 only

(c) 1 and 4 only

(d) 1, 2 and 3 only

143. Which one of the following is an important point for an efficient airport vehicular circulation and parking system?

(a) Two-way traffic wherever possible

(b) A maximum of driveway intersections

(c) Inadequate driveway width to permit overtaking

(d) Sufficiently and clearly defined parking and circulation routes

144. The suitability of an area, as a site for airport terminal building development, is evolved in accordance with

(a) small area of car parking

(b) no direct access to main highways

(c) distant location with respect to runway

(d) sufficient area for the first stage of building development with possibility of future expansion

Directions :

Each of the following **six (06)** items consists of two statements, one labeled as 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the codes given below :

Codes :

(a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)

(b) Both Statement (I) and Statement (II) are individually true but Statement (II) is ***not*** the correct explanation of Statement (I)

(c) Statement (I) is true but Statement (II) is false

(d) Statement (I) is false but Statement (II) is true.

145. Statement (I) :

The water below the water table is known as soil moisture and above the water table as groundwater.

Statement (II) :

Extending down from the ground surface, is the soil zone or root zone, which is defined as being the depth of overburden that is penetrated by the roots of vegetation.

146. Statement (I) :

The rainwater collection for direct use can be practiced by collecting the water coming down from the roof into a storage tank of plastic, RCC or masonry.

Statement (II) :

In a campus, where sufficient space is not available, the water can be stored in an open excavated pond.

147. Statement (I) :

The soils in nature rarely exist separately as gravel, sand, silt, clay or organic matter.

Statement (II) :

The classification or grouping of soils is mainly based on one or two index properties of soil.

148. Statement (I) :

During pile driving, heads, helmets or caps are placed on the top of the pile to receive the blows of the hammer and to prevent damage to the head of the pile.

Statement (II) :

Piles are ordinarily driven to a resistance measured by the number of blows required for the last 5 cm of penetration.

149. Statement (I) :

The critical condition of d/s slope occurs when the reservoir is full and percolation is at its maximum rate.

Statement (II) :

The direction of seepage forces tends to increase the stability.

150. Statement (I) :

Dynamic surveying implies some sort of motion. It allows user to move during surveying and to collect data on move.

Statement (II) :

Rapid static surveying technique, also known as fast static technique, is much like static surveying except that the occupation times are longer.

SPACE FOR ROUGH WORK

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