ENGINEERING SERVICES
EXAMINATION-(P)2018

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

T.B.C. : SKP-D-CVL **Test Booklet Series**

Serial No.	**TEST BOOKLET**	**A**
0084957	**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.
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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 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 (0·33)** 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 **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.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

1. Consider the following statements for selecting building stones :

   1. Seasoning of stones is essential and is done by soaking in water
   2. Specific gravity of stone is to be more than 2·7
   3. Porosity of stone affects its durability
   4. Climatic conditions decide the type of stone to be used in construction

   Which of the above statements are correct ?

   (a) 1, 2 and 3 only
   (b) 1, 2 and 4 only
   (c) 1, 3 and 4 only
   (d) 2, 3 and 4 only

2. Consider the following statements :

   1. Hydrophobic cement grains possesses low wetting ability
   2. Rapid-hardening cement is useful in concreting under static, or running water
   3. Quick-setting cement helps concrete to attain high strength in the initial period
   4. White cement is just a variety of ordinary cement free of colouring oxides

   Which of the above statements are correct ?

   (a) 1 and 4 only
   (b) 1 and 3 only
   (c) 2 and 4 only
   (d) 2 and 3 only

3. Consider the following statements :

   1. Rich mixes are less prone to bleeding than lean ones
   2. Bleeding can be reduced by increasing the fineness of cement

   Which of the above statements is/are correct ?

   (a) 1 only
   (b) 2 only
   (c) Both 1 and 2
   (d) Neither 1 nor 2

4. The yield of concrete per bag of cement for a concrete mix proportion of 1 : 1·5 : 3 (with adopting $\frac{2}{3}$ as the coefficient) is

   (a) 0·090 m^3
   (b) 0·128 m^3
   (c) 0·135 m^3
   (d) 0·146 m^3

5. Consider the following statements :

   1. Workability of concrete increases with the increase in the proportion of water content
   2. Concrete having small-sized aggregates is more workable than that containing large-sized aggregate
   3. For the same quantity of water, rounded aggregates produce a more workable concrete mix as compared to angular and flaky aggregates
   4. A concrete mix with no slump shown in the slump cone test indicates its very poor workability

   Which of the above statements are correct ?

   (a) 1, 2 and 3 only
   (b) 1, 2 and 4 only
   (c) 1, 3 and 4 only
   (d) 2, 3 and 4 only

6. A steel wire of 20 mm diameter is bent into a circular shape of 10 m radius. If E, the modulus of elasticity, is 2×10^6 kg/cm^2, then the maximum tensile stress induced in the wire is, nearly

(a) 2×10^3 kg/cm^2

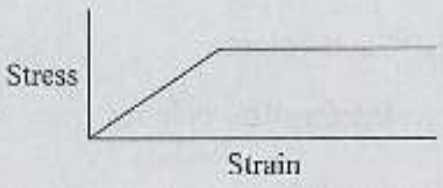
(b) 4×10^3 kg/cm^2

(c) 2×10^4 kg/cm^2

(d) 4×10^4 kg/cm^2

7. The stress-strain curve for an ideally plastic material is

(a)



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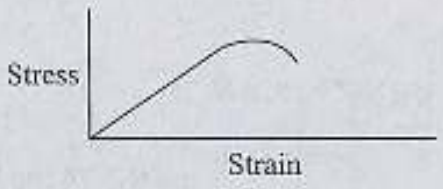

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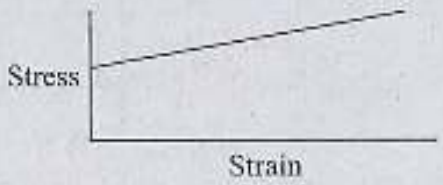

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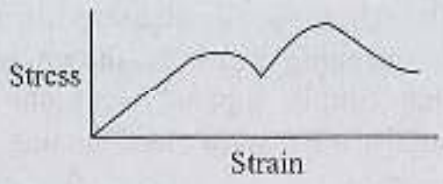


8. A long rod of uniform rectangular section with thickness t, originally straight, is bent into the form of a circular arch with displacement d at the mid-point of span l. The displacement d may be regarded as small as compared to the length l. The longitudinal surface strain is

(a) $\dfrac{2td}{l^2}$

(b) $\dfrac{4td}{l^2}$

(c) $\dfrac{8td}{l^2}$

(d) $\dfrac{16td}{l^2}$

9. If strains on a piece of metal are $\varepsilon_x = -120\ \mu$m/m, $\varepsilon_y = -30\ \mu$m/m, and $\gamma = 120\ \mu$m/m, what is the maximum principal strain ?

(a) 0

(b) 50 μm/m

(c) 75 μm/m

(d) 150 μm/m

10. The state of stress at a point is given by : $\sigma_x = 80$ MPa, $\sigma_y = 100$ MPa and $\tau_{xy} = 60$ MPa. If the yield strength for the material is 150 MPa, as determined in a uniaxial test, then the maximum shear stress is, nearly

(a) 150·8 MPa

(b) 127·4 MPa

(c) 119·3 MPa

(d) 104·0 MPa

11. Principal stresses at a point in an elastic material are 1·5 σ (tensile), σ (tensile) and 0·5 σ (compressive). The elastic limit in tension is 210 MPa and $\mu = 0{\cdot}3$. The value of σ at failure when computed by maximum principal strain theory is, nearly

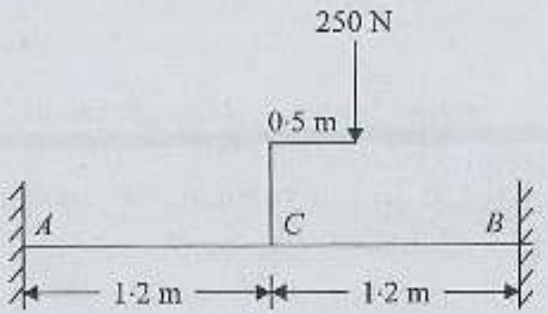
(a) 140·5 MPa

(b) 145·5 MPa

(c) 150·5 MPa

(d) 155·5 MPa

12.



A horizontal bar of 40 mm diameter solid section is 2·40 m long and is rigidly held at both ends so that no angular rotation occurs axially or circumferentially at the ends (as shown in figure). The maximum tensile stress in the bar is nearly

(a) 12·2 N/mm^2

(b) 13·7 N/mm^2

(c) 15·2 N/mm^2

(d) 16·7 N/mm^2

13. A solid shaft A of diameter D and length L is subjected to a torque T; another shaft B of the same material and of the same length, but half the diameter, is also subjected to the same torque T. The ratio between the angles of twist of shaft B to that of shaft A is

(a) 32

(b) 16

(c) 8

(d) 4

14. The required diameter for a solid shaft to transmit 400 kW at 150 rpm, with the working shear stress not to exceed 80 MN/m^2, is nearly

(a) 125 mm

(b) 121 mm

(c) 117 mm

(d) 113 mm

15. An RCC column of 4 m length is rigidly connected to the slab and to the foundation. Its cross-section is (400×400) mm^2. The column will behave as a/an

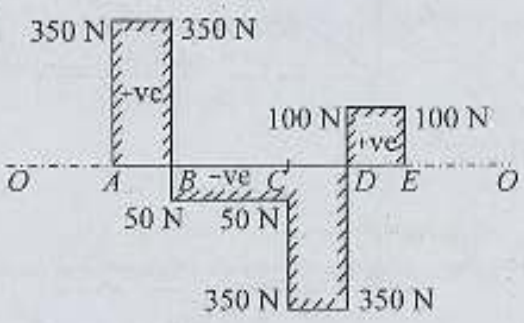
(a) Long column

(b) Short column

(c) Intermediate column

(d) Linkage

16.



The shear force diagram of a single overhanging beam is shown in figure. One simple support is at end A. The 'total' downward load acting on the beam is

(a) 800 N

(b) 600 N

(c) 400 N

(d) 200 N

17. The deformation of a vertically held bar of length L and cross-section A is due to its self-weight only. If Young's modulus is E and the unit weight of the bar is γ, the elongation dL is

(a) $\frac{\gamma L^3}{2E}$

(b) $\frac{EL^2}{2\gamma}$

(c) $\frac{\gamma L^2}{2E}$

(d) $\frac{\gamma L^2}{2AE}$

18. For a material, the modulus of rigidity is 100 GPa and the modulus of elasticity is 250 GPa. The value of the Poisson's ratio is

(a) 0·20

(b) 0·25

(c) 0·30

(d) 0·35

19. Two persons weighing W each are sitting on a plank of length L floating on water, at $\frac{L}{4}$ from either end. Neglecting the weight of the plank, the bending moment at the middle point of the plank is

(a) $\frac{WL}{16}$

(b) $\frac{WL}{64}$

(c) $\frac{WL}{8}$

(d) Zero

20. In the case of a rectangular beam subjected to a transverse shearing force, the ratio of maximum shear stress to average shear stress is

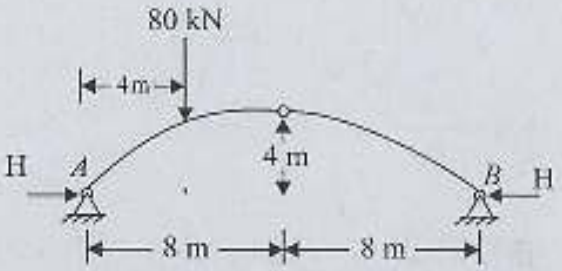
(a) 0·75

(b) 1·00

(c) 1·25

(d) 1·50

21.



The horizontal thrust of the three-hinged arch loaded as shown in the figure is

(a) 20 kN

(b) 30 kN

(c) 40 kN

(d) 50 kN

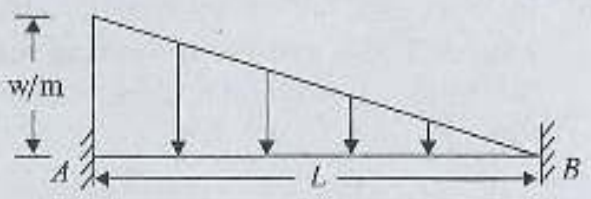
22. Each span of a two-span continuous beam of uniform flexural rigidity is 6 m. All three supports are simple supports. It carries a uniformly distributed load of 20 kN/m over the left span only. The moment at the middle support is

(a) 90 kNm Sagging

(b) 45 kNm Hogging

(c) 90 kNm Hogging

(d) 45 kNm Sagging

23. 

A fixed beam is loaded as in figure. The fixed end moment at support A is

(a) $\frac{wL^2}{30}$

(b) $\frac{wL^2}{20}$

(c) $\frac{wL^2}{10}$

(d) $\frac{wL^2}{8}$

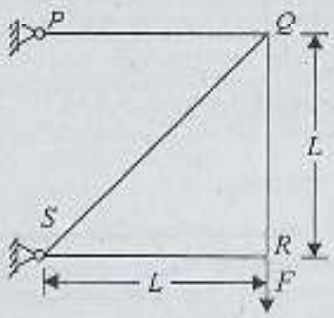
24. For a plane truss member, the length is 2 m, $E = 200$ GPa and area of cross-section is 200 mm^2. The stiffness matrix coefficient K_{11} with reference to its local axis is

(a) 200 N/m

(b) 2×10^7 N/m

(c) 4×10^7 N/m

(d) 400 N/m

25. 

For the truss shown in the figure, the force in the member PQ is

(a) F

(b) $\frac{F}{\sqrt{2}}$

(c) $\sqrt{2}F$

(d) $2F$

26. An important building is located in earthquake zone V in India. The seismic weight of the building is 10000 kN and it is designed by ductility considerations. The spectral acceleration factor for this structure is 2·5. The base shear for this structure is

(a) 1350 kN

(b) 5000 kN

(c) 10000 kN

(d) 25000 kN

27. An RCC slab (M 25 grade), of dimensions 5 m × 5 m × 0·15 m, is supported on four square columns (M 25 grade) of side 400 mm, the clear height of each column being 3 m. Assuming rigid connections, the fundamental time period of vibration of the slab along the horizontal direction is nearly

(a) 4·12 s

(b) 2·80 s

(c) 0·50 s

(d) 0·07 s

28. Consider the following statements regarding suspension cables :

1. The horizontal component of the cable tension in a suspension bridge is constant at every point along the length of the cable

2. Stiffening girders in a suspension bridge carry only the live load

Which of the above statements is/are correct ?

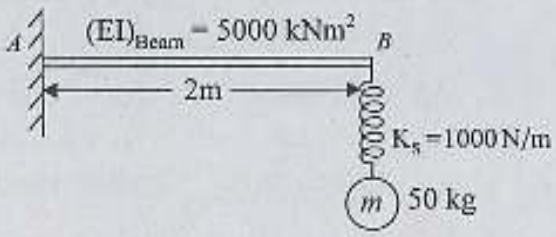
(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

29.



The fundamental time period of vibration of the system shown in the figure, by neglecting the self weight of the beam, is nearly

(a) 0·2 sec

(b) 0·8 sec

(c) 1·4 sec

(d) 2·8 sec

30. Consider the following statements with reference to the design of welded tension members :

1. The entire cross-sectional area of the connected leg is assumed to contribute to the effective area in the case of angles

2. Two angles, back-to-back and tack-welded as per the codal requirements, may be assumed to behave as a tee-section

3. A check on slenderness ratio may be necessary in some cases

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

31. A steel column is pinned at both ends and has a buckling load of 200 kN. If the column is restrained against lateral movement at its mid-height, its buckling load will be

(a) 100 kN

(b) 200 kN

(c) 400 kN

(d) 800 kN

32. Consider the following statements in respect of column splicing :

1. Splices should be provided close to the point of inflection in a member
2. Splices should be located near to the point of lateral restraint in a member
3. Machined columns for perfect bearing would need splices to be designed for axial force only

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

33. Buckling of the compression flange of a girder, without transverse stiffeners, can be avoided if (with standard notations)

(a) $\frac{d}{t_w} \leq 345\,\varepsilon_f^2$

(b) $\frac{d}{t_w} \leq 270\,\varepsilon_f^2$

(c) $\frac{d}{t_w} \leq 270\,\varepsilon_w$

(d) $\frac{d}{t_w} \leq 250\,\varepsilon_w$

34. A simply supported steel beam of rectangular section and of span L is subjected to a uniformly distributed load. The length of the plastic hinge by considering moment ratio of 1·5 will be nearly

(a) 0·27 L

(b) 0·39 L

(c) 0·45 L

(d) 0·58 L

35. A single angle of thickness 10 mm is connected to a gusset by 6 numbers of 18 mm diameter bolts, with pitch of 50 mm and with edge distance of 30 mm. The net area in block shear along the line of the transmitted force is

(a) 1810 mm^2

(b) 1840 mm^2

(c) 1920 mm^2

(d) 1940 mm^2

36. Consider the following statements for the design of a laced column :

1. In a bolted construction, the minimum width of the lacing bar shall be three times the nominal diameter of the end bolt
2. The thickness of the flat of a single lacing system shall be not less than one-fortieth of its effective length
3. The angle of inclination of the lacing bar should be less than 40° with the axis of the built-up column
4. The lacing shall be designed for a transverse shear of 2·5% of the axial load on the column

Which of the above statements are correct ?

(a) 1, 2 and 3 only

(b) 1, 2 and 4 only

(c) 1, 3 and 4 only

(d) 1, 2, 3 and 4

37. The permissible bending compressive strength for M 25 grade of concrete is 8·5 N/mm^2. Its short-term and long-term modular ratios are, nearly

(a) 8 and 11

(b) 8 and 8

(c) 11 and 11

(d) 11 and 6

38. The ultimate load carrying capacity of a short circular column of 300 mm diameter with 1% helical reinforcement of Fe 415 grade steel and concrete of M 20 grade, is nearly

(a) 451 kN

(b) 500 kN

(c) 756 kN

(d) 794 kN

39. In a cantilever retaining wall, the main steel reinforcement is provided

(a) On the backfill side, in the vertical direction

(b) On both, inner and outer, faces

(c) In horizontal as well as in vertical directions

(d) To counteract shear stresses

40. Design strength for M 25 concrete in direct compression, bending compression and flexural tension are, respectively

(a) 10 MPa, 11·15 MPa and 3·5 MPa

(b) 25 MPa, 11·15 MPa and 3 MPa

(c) 10 MPa, 12·5 MPa and 3·5 MPa

(d) 25 MPa, 11·15 MPa and 2·57 MPa

41. Double-pitched roof trusses of span 20 m and rise 7·5 m are placed at 8 m spacing. The maximum live load reaction at the supports is nearly

(a) 36 kN

(b) 40 kN

(c) 46 kN

(d) 60 kN

42. Ground motion during earthquake is random in nature. For the purpose of analysis, it can be converted into different harmonic excitations through

(a) Fourier series

(b) Newton's second law

(c) Duhamel's integral

(d) Time series analysis

43. An RCC structure with fundamental time period of 1·2 sec vibrates at a forcing frequency of 10 rad/sec. The maximum dynamic displacement is X% of static displacement. The value of X is

(a) 10·1

(b) 28·9

(c) 37·7

(d) 50·2

44. A steel building has plan dimensions of 50 m × 50 m and it is 120 m tall. It is provided with brick infill panels. The approximate fundamental time period of the building is

(a) 1·53 sec

(b) 2·72 sec

(c) 3·08 sec

(d) 4·15 sec

45. A masonry structure has a prism strength of 10 N/mm^2 with $\mu = 0{\cdot}25$. The modulus of elasticity and the shear modulus of the masonry are, respectively

(a) 5500 MPa and 2200 MPa

(b) 2000 MPa and 2200 MPa

(c) 5500 MPa and 1000 MPa

(d) 2000 MPa and 1000 MPa

46. The surface tension in a soap bubble of 20 mm diameter, when the inside pressure is 2·0 N/m^2 above atmospheric pressure, is

(a) 0·025 N/m

(b) 0·0125 N/m

(c) 5×10^{-3} N/m

(d) $4{\cdot}25 \times 10^{-3}$ N/m

47. Consider the following statements regarding labour welfare :

1. Work prompted by mere sympathy and kindness may degenerate and may injure the worker's sense of self-respect
2. Rapid industrialization on a large scale poses problems in respect of labour and its welfare
3. Construction labour is still largely unorganized, and, hence, lacks in welfare measures

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 1 and 3 only

(c) 1, 2 and 3

(d) 2 and 3 only

48. A soil sample has an average grain diameter as 0·03 mm. The size of interstices is one-eighth of the mean grain diameter. Considering σ of water as 0·075 g/cm, the water will rise in the clay to a height of

(a) 2·4 m

(b) 3·0 m

(c) 3·6 m

(d) 4·0 m

49. A jet of water has a diameter of 0·3 cm. The absolute surface tension of water is 0·072 N/m and atmospheric pressure is 101·2 kN/m^2. The absolute pressure within the jet of water will be

(a) 101·104 kN/m^2

(b) 101·152 kN/m^2

(c) 101·248 kN/m^2

(d) 101·296 kN/m^2

50. A glass tube of 2·5 mm internal diameter is immersed in oil of mass density 940 kg/m^3 to a depth of 9 mm. If a pressure of 148 N/m^2 is needed to form a bubble which is just released, what is the surface tension of the oil ?

(a) 0·041 N/m

(b) 0·043 N/m

(c) 0·046 N/m

(d) 0·050 N/m

51. In a rectangular open channel, 2·0 m wide, water flows at a depth of 0·8 m. It discharges over an aerated sharp-crested weir over the full width, with depth over weir crest being 0·25 m. $C_C = 0{\cdot}61$. Adjusting for velocity head of approach, what would be the discharge through the channel ? $\sqrt{2g} = 4{\cdot}43$ units

(a) 0·439 m^3/sec

(b) 0·445 m^3/sec

(c) 0·453 m^3/sec

(d) 0·461 m^3/sec

52. A steady, two dimensional, incompressible flow field is represented by
$u = x + 3y + 3$ and $v = 2x - y - 8$
In this flow field, the stagnation point is

(a) (3, 2)

(b) (–3, 2)

(c) (–3, –2)

(d) (3, –2)

53. If the energy present in a jet of water of 20 cm diameter and having a velocity of 25 m/s could be extracted by a device with 90% efficiency, the power extracted would be nearly

$$\left(\text{taking } \frac{1}{2g} = 0{\cdot}051 \ \frac{\text{sec}^2}{\text{m}} \right)$$

(a) 180 kW

(b) 225 kW

(c) 260 kW

(d) 300 kW

54. In a siphon, the summit is 5 m above the water level in the tank from which the flow is being discharged. If the head loss from the inlet to the summit is 2·5 m and the velocity head at the summit is 0·5 m, (taking $\gamma = 10$ appropriate units) the pressure head at the summit is

(a) –80 kPa

(b) –3 m of water (abs)

(c) 5 m of water (abs)

(d) 18 m of water (abs)

55. The stream function of a doublet with horizontal axis and of strength μ is

(a) $\frac{\mu}{2\pi} r$

(b) $\frac{\mu}{2\pi r} \cos\theta$

(c) $\frac{\mu}{2\pi} r \sin\theta$

(d) $\frac{\mu}{2\pi} \frac{\sin\theta}{r}$

56. A vertical cylindrical tank, 2 m diameter has, at the bottom, a 5 cm diameter, sharp-edged orifice, for which $C_d = 0{\cdot}6$. Water enters the tank at a constant rate of 9 *l*/sec. At what depth above the orifice will the level in the tank become steady ?

(a) 2·95 m

(b) 2·75 m

(c) 2·60 m

(d) 2·50 m

57. A transmitter antenna is of a vertical pipe, 20 cm diameter and 25 m height, on top of a tall structure. It is subjected to wind speed of 20 m/sec. Density of air is 1·22 kg/m^3; its viscosity is $1{\cdot}8 \times 10^{-5}$ Ns/m^2. Drag coefficient of a (tall) circular cylinder is tabulated as

R_e	10^2	10^3	$1{\cdot}3\times10^5$	10^4	$1{\cdot}5\times10^4$	$1{\cdot}06\times10^5$	$1{\cdot}2\times10^5$	$4{\cdot}5\times10^5$
C_D	1·6	1·05	0·95	1·0	1·08	1·0	0·89	0·26

What is the drag experienced ?

(a) 737 N

(b) 700 N

(c) 670 N

(d) 63 N

58. A smooth flat plate with a sharp leading edge is placed along a free stream of water flowing at 2·5 m/sec. At what distance from the leading edge will the boundary layer transition from laminar to turbulent flow ? Take density of water as 1000 kg/m^3 and its viscosity as 1 centipoise. Also, what will be the boundary layer thickness at that distance ?

(a) 12·8 cm and 0·113 cm

(b) 14·2 cm and 0·113 cm

(c) 12·8 cm and 0·125 cm

(d) 14·2 cm and 0·125 cm

59. What is the rotational speed in rpm of a 0·8 m diameter cylindrical container, held with axis vertical, if the fluid contained in it rises to 0·6 m height at the sides and leaves a circular space 0·3 m diameter on the bottom uncovered ?

(a) 90·2 rpm

(b) 88·4 rpm

(c) 86·0 rpm

(d) 83·7 rpm

60. If δ_1 and δ_2 are the laminar boundary layer thicknesses at a point M distant x from the leading edge when the Reynolds number of the flow are 100 and 484, respectively, then the ratio $\frac{\delta_1}{\delta_2}$ will be

(a) 2·2

(b) 4·84

(c) 23·43

(d) 45·45

61. In a 90° triangular notch, the error in the estimated discharge for a given head due to an error of 1% in cutting the vertex angle is

(a) zero

(b) 1%

(c) $\frac{\pi}{2}\%$

(d) $\pi\%$

62. Consider the following statements :

1. All soils can be identified in the field by visual examination
2. Fine-grained soils can be identified in the field by visual examination and touch
3. Fine-grained soils can be identified in the field by dilatancy test
4. By visual examination, only coarse-grained soils can be identified

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 3 and 4 only

(d) 1 and 4 only

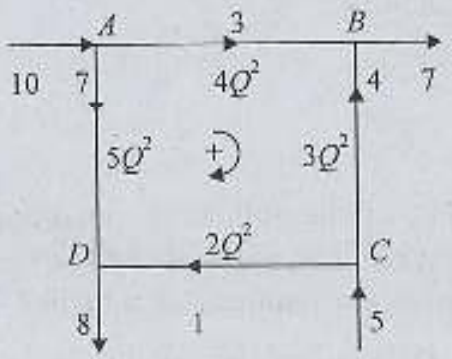
63. An open channel is of isosceles triangle shape, with side slopes 1 vertical and n horizontal. The ratio of the critical depth to specific energy at critical depth will be

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

(b) $\frac{3}{4}$

(c) $\frac{4}{5}$

(d) $\frac{5}{6}$

64. 

A pipe network is shown with all needful input data to compute the first iteration improved magnitudes of the initially assumed flows in the branches. What will be the such improved flow magnitudes in branches AB and CD? Consider to first decimal accuracy.

(a) A to B : 5·1; C to D : 3·1

(b) A to B : 5·7; C to D : 2·8

(c) A to B : 4·9; C to D : 3·4

(d) A to B : 5·5; C to D : 3·8

65. A 2 m wide rectangular channel carries a discharge of 10 m^3/s. What would be the depth of flow if the Froude number of the flow is 2·0?

(a) 1·72 m

(b) 1·36 m

(c) 0·86 m

(d) 0·68 m

66. M_3 Profile is indicated by which of the following conditions?

(a) $y_0 > y_c > y$

(b) $y > y_0 > y_c$

(c) $y_c > y_0 > y$

(d) $y > y_c > y_0$

67. Floating logs of wood tend to move to the mid-river reach on the water surface. This is due to

(a) Least obstruction from the banks

(b) 2-cell transverse circulation in the flow

(c) Fastest velocity along the mid-river reach

(d) Near-symmetry of the isovels across the section is conducive to principle of least work

68. The sequent depth ratio in a rectangular channel is 14. The Froude number of the supercritical flow will be

(a) 6·62

(b) 7·55

(c) 8·45

(d) 10·25

69. In a hydraulic jump, the depths on the two sides are 0·4 m and 1·4 m. The head loss in the jump is nearly

(a) 0·45 m

(b) 0·65 m

(c) 0·80 m

(d) 0·90 m

70. A 20 cm centrifugal pump runs at 1400 rpm delivering 0·09 m^3/sec against a head of 45 m with an efficiency of 87%. What is its non-dimensional specific speed using *rps* as the relevant data component ?

(a) 0·482

(b) 0·474

(c) 0·466

(d) 0·458

71. Two identical centrifugal pumps are connected in parallel to a common delivery pipe of a system. The discharge performance curve of each of the pumps is represented by $H = 30 - 80Q^2$. The discharge-head equation of the parallel duplex pump set is

(a) $H = 30 - 80Q^2$

(b) $H = 15 - 20Q^2$

(c) $H = 30 - 20Q^2$

(d) $H = 15 - 80Q^2$

72. Consider the following data relating to the performance of a centrifugal pump : speed = 1200 rpm, flow rate = 30 *l*/s, head = 20 m, and power = 5 kW. If the speed of the pump is increased to 1500 rpm, assuming the efficiency is unaltered, the new flow rate and head, respectively, will be

(a) 46·9 *l*/s and 25·0 m

(b) 37·5 *l*/s and 25·0 m

(c) 46·9 *l*/s and 31·3 m

(d) 37·5 *l*/s and 31·3 m

73. The work done by a kN of water jet moving with a velocity of 60 m/sec when it impinges on a series of vanes moving in the same direction with a velocity of 9 m/sec is

(a) 60·2 kN m

(b) 55·6 kN m

(c) 46·8 kN m

(d) 45·0 kN m

74. The velocity heads of water at the inlet and outlet sections of a draft tube are 3·5 m and 0·3 m, respectively. The frictional and other losses in the draft tube can be taken as 0·5 m. What is the efficiency of the draft tube ?

(a) 84·4%

(b) 80·0%

(c) 77·1%

(d) 74·4%

75. Which of the following situations can be attributed to sustained excessive groundwater pumping in a basin ?

1. Drying up of small lakes and streams over a period in spite of normal rainfall
2. Deterioration of groundwater quality in certain aquifers
3. Land subsidence in the basin
4. Increase in seismic activity
5. Increased cost of groundwater extraction

(a) 2 and 4 only

(b) 1, 2, 3 and 5 only

(c) 3 and 4 only

(d) 1 and 5 only

76. Horton's infiltration equation was fitted to data from an infiltration test. It was found that the initial infiltration capacity was 20 mm/h, final infiltration capacity was 5 mm/h and the exponential decay constant was $0{\cdot}5\ h^{-1}$. If the infiltration was at capacity rates, the total infiltration depth for a uniform storm of 10 h duration would be

(a) 80 mm

(b) 50 mm

(c) 30 mm

(d) 20 mm

77. Consider the following statements regarding turbines :

1. The main function of a governor is to maintain a constant speed even as the load on the turbine fluctuates

2. In the case of Pelton turbines, the governor closes or opens the wicket gates

3. In the case of Francis turbines, the governor opens or closes the needle valve

4. In the case of a Kaplan turbine, the governor swings the runner blades appropriately in addition to further closing or further opening of the wicket gates

Which of the above statements are correct ?

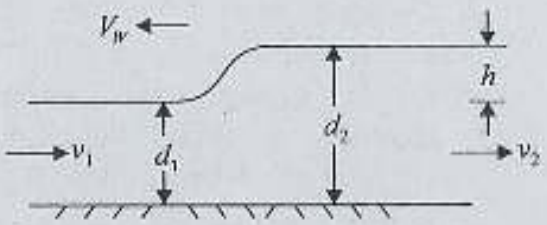
(a) 1 and 3 only

(b) 2 and 4 only

(c) 2 and 3 only

(d) 1 and 4 only

78.



Consider the occurrence of a surge at the water surface of a wide rectangular channel flow, as in the figure, where the one-dimensionally considered velocities are v_1 and v_2 and the depths are d_1 and d_2, with the surge height h, whereby $d_2 - d_1 = h$, moving at a speed of V_W over depth d_1. Joint application of continuity and momentum principles will indicate the surge front speed V_W, to be

(a) $V_W = \sqrt{gd_1}\left(1+\frac{3}{2}\frac{h}{d_1}\right)^{\frac{1}{2}}$

(b) $V_W = \sqrt{gd_1}\left(1+\frac{3}{2}\frac{h}{d_1}+\frac{1}{2}\left(\frac{h}{d_1}\right)^2\right)^{\frac{1}{2}}$

(c) $V_W = \sqrt{gd_1}\left(1+\frac{h}{d_1}\right)^{\frac{1}{2}}$

(d) $V_W = \sqrt{gd_1}\left(1+\left(\frac{h}{d_1}\right)^2\right)^{\frac{1}{2}}$

79. Which of the following will pose difficulties in adopting *u.h.g.* principles and processes in evaluating flood hydrographs of basins ?

1. Non-uniform areal distribution within a storm
2. Intensity variation within a storm
3. The centre of the storm varying from storm to storm in case of large catchments
4. Dividing into a number of sub-basins and routing the individual DRHs through their respective channels to obtain the composite DRH at the basin outlet
5. Large storages within the catchment

(a) 1, 3 and 4 only

(b) 2, 3 and 4 only

(c) 1, 2 and 5 only

(d) 1, 2, 3 and 5 only

80. Rainfall of magnitude 4·3 cm, followed by 3·7 cm, occurred on two consecutive 4 h durations on a catchment area of 25 km^2, and there resulted a DRH (after isolation of base flow in the flood flow hydrograph) with the following ordinates starting from the beginning of the rainfall. (Adopt trapezoidal formula)

Time (hours)	0	4	8	12	16	20	24	28	32	36	40	44
DRH (ordinate m^3/sec)	0	9	16	20	20	17·8	13·4	9·4	6·2	3·7	1·8	0

What is the ϕ index value ?

(a) 0·149 cm/h

(b) 0·155 cm/h

(c) 0·161 cm/h

(d) 0·167 cm/h

81. Groundwater flows through an aquifer with a cross-sectional area of $1·0 \times 10^4$ m^2 and a length of 1500 m. Hydraulic heads are 300 m and 250 m at the groundwater entry and exit points in the aquifer, respectively. Groundwater discharges into a stream at the rate of 750 m^3/day. Then the hydraulic conductivity of the aquifer is

(a) 1·50 m/day

(b) 2·25 m/day

(c) 3·50 m/day

(d) 4·25 m/day

82. A hydraulic turbine develops 5000 kW under a head of 30 m when running at 100 rpm. This turbine belongs to the category of

(a) Pelton wheel

(b) Francis Turbine

(c) Kaplan Turbine

(d) Propeller Turbine

83. The rate of rainfall for the successive 30 min periods of a 3-hour storm are : 1·6, 3·6, 5·0, 2·8, 2·2 and 1·0 cm/hour. The corresponding surface runoff is estimated to be 3·2 cm. Then, the ϕ index is

(a) 1·5 cm/h

(b) 1·8 cm/h

(c) 2·1 cm/h

(d) 2·4 cm/h

84. For stability analysis of slopes of purely cohesive soils, the critical centre is taken to lie at the intersection of

(a) The perpendicular bisector of the slope and the locus of the centre

(b) The perpendicular drawn at the one-third slope from the toe and the locus of the centre

(c) The perpendicular drawn at the two-third slope from the toe and the locus of the centre

(d) Directional angles

85. Consider the following statements regarding water logging :

1. Water logging is the rise of groundwater table leading to possible increase in salinity resulting in a reduction in the yield of crops

2. Water logging cannot be eliminated in certain areas but can be controlled only if the quantity of water percolating into that soil is checked and reduced

Which of the above statements is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

86. Annual rainfall values at station A in mm for the years 2001 to 2010 are given in the table below. If simple central 3-year moving mean of this rainfall record is calculated, the maximum and minimum values in the moving mean list would be

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Annual Rainfall P at station A (mm)	586	621	618	639	689	610	591	604	621	650

(a) 689 mm and 602 mm

(b) 649 mm and 602 mm

(c) 689 mm and 586 mm

(d) 649 mm and 586 mm

87. Khosla's formulae for assessing pressure distribution under weir floors are based on

(a) Potential flow in permeable layers just beneath the floors

(b) Boundary layer flow with pressure drop longitudinally

(c) Conformal transformation of potential flow into the w plane

(d) Simplification of 3-D flow

88. In a siphon aqueduct, the worst condition of uplift on the floor occurs when

(a) The canal is full and the drainage is empty, with water table at drainage bed level

(b) The canal is empty and the drainage is full, with water table at drainage bed level

(c) Both the canal and the drainage are full

(d) The canal is empty and the drainage is full, with water table below the floor

89. Zero hardness of water is achieved by

(a) Lime-soda process

(b) Ion exchange treatment

(c) Excess lime treatment

(d) Excess alum dosage

90. Five-days *BOD* of a 10% diluted sample having D_O = 6·7 mg/*l*, D_S = 2 mg/*l* and consumption of oxygen in blank = 0·5 mg/*l*, will be

(a) 22 mg/*l*

(b) 42 mg/*l*

(c) 62 mg/*l*

(d) 82 mg/*l*

91. Which one of the following statements related to testing of water for municipal use is correctly applicable ?

(a) Pseudo-hardness is due to presence of fluoride in water

(b) When alkalinity ≥ total hardness, Carbonate hardness in mg/*l* = Total hardness in mg/*l*

(c) Bicarbonate alkalinity = total alkalinity – (carbonate alkalinity – hydroxide alkalinity)

(d) Hydroxide alkalinity = Carbonate alkalinity + Bicarbonate alkalinity

92. The capacity of a service reservoir in a campus should cater to

(a) Sum total of balancing storage, breakdown storage and fire reserve

(b) Sum total of balancing storage and fire reserve

(c) Sum total of breakdown storage and fire reserve

(d) Balancing storage only

93. Consider the following statements regarding groundwater pollutants :

1. Most of the groundwaters are generally non-alkaline
2. A moderate amount of fluoride, about 0·6 mg/*l* to 1·5 mg/*l*, in drinking water, would help in good development of teeth
3. Natural waters do not have dissolved mineral matter in them

Which of the above statements is/are correct ?

(a) 1 only

(b) 2 only

(c) 3 only

(d) 1, 2 and 3

94. Consider the following statements regarding anchorage of pipelines conveying water :

1. At bends, pipes tend to pull apart
2. At bends, forces exerted on the joints due to longitudinal shearing stresses are enormous and the joints may get loosened
3. To avoid problems by hydrodynamic effects, pipes are anchored using concrete blocks which absorb side thrusts at bends
4. Pipes are also anchored on steep slopes

Which of the above statements are correct ?

(a) 1, 2 and 3 only

(b) 1, 2 and 4 only

(c) 1, 3 and 4 only

(d) 1, 2, 3 and 4

95. Consider the following statements with reference to bioenergy as a renewable energy source :

1. Plants ensure continuous supply of gas due to their continuous growth
2. Cost of obtaining energy from biogas is less than that from fossil fuels
3. Digestion of sludge may produce H_2S and NO_X which are injurious to human health
4. 'Floating dome' installation is the preferred option as it supplies gas at constant pressure irrespective of quantity of gas produced

Which of the above statements are correct ?

(a) 1, 2 and 3 only

(b) 1, 2 and 4 only

(c) 2, 3 and 4 only

(d) 1, 3 and 4 only

96. Consider the following statements regarding waste stabilization ponds :

1. The pond has a symbiotic process of waste stabilization through algae on one hand and bacteria on the other
2. The oxygen in the pond is provided by algae through photosynthesis
3. The detention period is of the order of two to three days
4. The bacteria which develop in the pond are aerobic bacteria

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 3 and 4 only

(d) 1 and 4 only

97. The purpose of re-carbonation after water softening by the lime-soda process is the

(a) Removal of excess soda from the water

(b) Removal of non-carbonate hardness in the water

(c) Recovery of lime from the water

(d) Conversion of precipitates to soluble forms in the water

98. Environmental flow of a river refers to the quantity, quality and timing of the flow

(a) Required in the river to sustain the river ecosystem

(b) Required to maintain healthy ecological conditions in the command area of a river development project

(c) Generated by the ecosystem of the catchment of the river

(d) As the minimum requirement to support the cultural practices of the community living on the banks of the river

99. The moisture content of a certain Municipal Solid Waste with the following composition will be

	Wet, % weight	Dry, % weight
Food waste	10	03
Paper	35	30
Yard waste	20	10
Others	35	20

(a) 100%

(b) 63%

(c) 37%

(d) 13%

100. Consider the following statements :

1. When a soil sample is dried beyond its shrinkage limit, the volume of the soil slowly decreases
2. Plastic limit is always lower than the liquid limit for any type of soil
3. At the liquid limit, the soil behaves like a liquid and possesses no shear strength at all
4. When subjected to drying, the volume of the soil remains unchanged once the water content of the soil goes below its shrinkage limit

Which of the above statements are correct ?

(a) 1 and 3 only

(b) 1 and 4 only

(c) 2 and 3 only

(d) 2 and 4 only

101. Consider the following statements in respect of the troposphere :

1. The gaseous content constantly churns by turbulence and mixing
2. Its behaviour makes the weather
3. The ultimate energy source for producing any weather change is the sun
4. The height of the troposphere is nearly 11 km at the equatorial belt and is 5 km at the poles

Which of these are true of the troposphere ?

(a) 1, 2 and 3 only

(b) 1, 2 and 4 only

(c) 1, 3 and 4 only

(d) 2, 3 and 4 only

102. A sand sample has a porosity of 30% and specific gravity of solids as 2·6. What is its degree of saturation at moisture content of 4·94% ?

(a) 40%

(b) 35%

(c) 30%

(d) 25%

103. What will be the unit weight of a fully saturated soil sample having water content of 38% and grain specific gravity of 2·65 ?

(a) 19·88 kN/m^3

(b) 17·88 kN/m^3

(c) 16·52 kN/m^3

(d) 14·65 kN/m^3

104. How many cubic metres of soil having void ratio of 0·7 can be made from 30 m^3 of soil with void ratio of 1·2 ?

(a) 36·6 m^3

(b) 30·0 m^3

(c) 25·9 m^3

(d) 23·2 m^3

105. A dry sand specimen is put through a tri-axial test. The cell pressure is 50 kPa and the deviator stress at failure is 100 kPa. The angle of internal friction for the sand specimen is

(a) 15°

(b) 30°

(c) 45°

(d) 55°

106. The theory of consolidation predicts settlement due to primary consolidation; it cannot include settlement due to initial compression nor due to secondary consolidation. This happens because of the following assumptions made in developing the theory :

1. Soil grains and water are incompressible
2. Soil is fully saturated
3. Compression takes place in the vertical direction only
4. Time lag in consolidation is entirely due to low permeability of soil

Which of the above statements are correct ?

(a) 1, 2 and 3 only

(b) 1, 2 and 4 only

(c) 3 and 4 only

(d) 1, 2, 3 and 4

107. Consider the following statements :

1. Secondary consolidation results due to prolonged dissipation of excess hydrostatic pressure
2. Primary consolidation happens under expulsion of both air and water from voids in early stages
3. Initial consolidation in the case of fully saturated soils is mainly due to compression of solid particles
4. Primary consolidation happens more quickly in coarse-grained soils than in fine-grained soils

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 3 and 4 only

(d) 1 and 4 only

108. Consider the following statements with regard to Soil Testing :

1. The origin and pole are at the same point in a Mohr's circle
2. The shear stress is maximum on the failure plane
3. Mohr's circle drawn with data from an unconfined compression test passes through the origin
4. Maximum shear stress occurs on a plane inclined at 45° to the principal plane

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 3 and 4 only

(d) 1 and 4 only

109. A soil yielded a maximum dry unit weight of 18 kN/m^3 at a moisture content of 16% during a Standard Proctor Test. What is the degree of saturation of the soil if its specific gravity is 2·65 ?

(a) 98·42%

(b) 95·50%

(c) 84·32%

(d) 75·71%

110. Consider the following assumptions regarding Coulomb's Wedge Theory :

1. There is equilibrium of every element within the soil mass of the material
2. There is equilibrium of the whole of the material
3. Backfill is wet, cohesive, and ideally elastic
4. The wall surface is rough

Which of the above assumptions are correct ?

(a) 1 and 3 only
(b) 1 and 4 only
(c) 2 and 3 only
(d) 2 and 4 only

111. In a clayey soil having 50 kN/m^2 as unit cohesion and 18 kN/m^3 as unit weight, an excavation is made with a vertical face. Taking Taylor's stability number as 0·261, what is the maximum depth of excavation so that the vertical face remains stable ?

(a) 5·30 m
(b) 7·06 m
(c) 10·6 m
(d) 12·4 m

112. What is the Boussinesq's vertical stress at a point 6 m directly below a concentrated load of 2000 kN applied at the ground surface ?

(a) 53·1 kN/m^2
(b) 26·5 kN/m^2
(c) 11·8 kN/m^2
(d) 8·8 kN/m^2

113. Consider the following statements :

1. In a reinforced concrete member subjected to flexure, the externally applied moment is resisted by an internal couple formed by steel and concrete and their magnitudes vary with the applied moment, while the lever arm of the internal couple remains constant
2. In a prestressed concrete member, the external moment is resisted by an internal couple, but it is the lever arm that changes with the loading conditions and the stress in steel remains practically constant

Which of the above statements is/are correct ?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

114. Consider the following statements with regard to Global Positioning Systems (GPS) :

1. The position of an object can be exactly determined by a single satellite
2. The position of the observer (moving person or vehicle) on ground is determined by an orbiting satellite
3. Atomic clocks are fixed in satellites to calculate the positioning of the satellite to aid in determining travel times
4. Absolute positioning, where accuracy of 1 cm to 5 cm is needed, depends upon the health of the satellite

Which of the above statements are correct ?

(a) 1, 2 and 3 only
(b) 1, 2 and 4 only
(c) 1, 3 and 4 only
(d) 2, 3 and 4 only

115. A temporary bench mark has been established at the soffit of a chejja on a window opening, and its known elevation is 102·405 m above mean sea level. The backsight used to establish the height of the instrument is by an inverted staff reading of 1·80 m. A foresight reading with the same staff, held normally, is 1·215 m on a recently constructed plinth. The elevation of the plinth is

(a) 95·42 m O.D

(b) 99·39 m O.D

(c) 102·42 m O.D

(d) 105·99 m O.D

116. A transition curve is to be provided for a circular railway curve of 300 m radius, the gauge being 1·5 m with the maximum superelevation restricted to 15 cm. What is the length of the transition curve for balancing the centrifugal force ?

(a) 72·3 m

(b) 78·1 m

(c) 84·2 m

(d) 88·3 m

117. Consider the following statements regarding Remote Sensing Survey :

1. Information transfer is accomplished by use of electromagnetic radiation
2. Remote Sensing from space is done by satellites
3. Remote Sensing has no application in Earthquake prediction

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

118. The rate of equilibrium superelevation on a road is

1. Directly proportional to the square of vehicle velocity
2. Inversely proportional to the radius of the horizontal curve
3. Directly proportional to the square of the radius of the horizontal curve

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

119. As per IRC 37 : 2012, the fatigue life of a flexible pavement consisting of granular base and sub-base depends upon

1. Resilient Modulus of bituminous layers
2. Horizontal tensile strain at the bottom of bituminous layer
3. Mix design of bitumen
4. Vertical subgrade strain

Which of the above statements are correct ?

(a) 1, 2 and 4 only

(b) 1, 3 and 4 only

(c) 1, 2 and 3 only

(d) 2, 3 and 4 only

120. Which one of the following types of steel is used in the manufacturing of metro and mono rails ?

(a) Mild steel

(b) Cast steel

(c) Manganese steel

(d) Bessemer steel

121. A sample of dry soil is coated with a thin layer of paraffin and has a mass of 460 g. It displaced 300 cc of water when immersed in it. The paraffin is peeled off and its mass was found to be 9 g. If the specific gravity of soil solids and paraffin are 2·65 and 0·9 respectively, the voids ratio of soil is nearly

(a) 0·92

(b) 0·71

(c) 0·59

(d) 0·48

122. Marshalling yard in railway system provides facilities for

(a) Maintenance of rolling stock

(b) Safe movements of passengers and coaches

(c) Receiving, breaking up, re-forming and dispatching onwards – of trains

(d) Receiving, loading, unloading and delivery of goods and vehicles, and scheduling their further functioning

123. 'Composite Sleeper Index' is relevant in determining :

1. Required and adoptable sleeper density
2. Durability of sleeper units
3. Mechanical strength of the stock of wooden sleepers

Which of the above statements is/are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 only

(d) 3 only

124. The normal flows on two approach roads at an intersection are respectively 500 pcu/h and 300 pcu/h. The corresponding saturation flow is 1600 pcu/h on each road. The total lost time per single cycle is 16 s. The optimum cycle time by Webster's method is

(a) 72·5 s

(b) 58·0 s

(c) 48·0 s

(d) 19·3 s

125. In the offshore region at a particular harbour facility, an oscillatory wave train approaches with wavelength of 80 m where the mean sea depth is 30 m. What would be the velocity of the individual waves ?

(a) 17·15 m/s

(b) 16·05 m/s

(c) 15·15 m/s

(d) 14·05 m/s

126. For proper planning of harbours, oscillatory waves in the relevant off shore region must be taken into account. If the sea depth is 30 m and an oscillatory waves train is observed to have wavelength of 50 m, what would be the velocity of the individual waves ?

(a) 9·43 m/s

(b) 9·21 m/s

(c) 9·08 m/s

(d) 8·83 m/s

Directions :

Each of the next **Twenty Four (24)** items consists of two statements, one labelled as 'Statement (I)' and the other as 'Statement (II)'. 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

127. Statement (I) : Glass, used as sheets in buildings, is a crystalline solid and is transparent.

Statement (II) : Glass is obtained by the fusion of silicates of sodium and calcium, both of which are crystalline in structure.

128. Statement (I) : Lime-surkhi mortar is used in construction of Anicuts (dams) since the 19th century.

Statement (II) : Portland cement is a recent material compared to surkhi-mortar which is best suited for hydraulic structures.

129. Statement (I) : Rapid method of concrete mix-design will take 3 days for trials.

Statement (II) : This rapid method depends on curing the concrete in warm water at or above 55°C.

130. Statement (I) : R.M.C. is preferably used in construction of large projects.

Statement (II) : R.M.C. is adoptable to achieve any desired strength of concrete, with simultaneous quality control.

131. Statement (I) : In a bolted joint, all similarly placed bolts share the load equally.

Statement (II) : Bolts are placed in holes having slightly larger diameters.

132. Statement (I) : In an RC beam, bond stress developed is due to pure adhesion, and frictional and mechanical resistance.

Statement (II) : Inadequacy of bond strength can be compensated by providing end anchorage in the reinforcing bars.

133. Statement (I) : A Dummy is an activity in the network.

Statement (II) : A Dummy is a representation in the network requiring neither time nor resources.

134. Statement (I) : In areas where extreme cold conditions are a regular feature, and more so particularly in winter, it is necessary to use lighter oil for automobiles than in summer.

Statement (II) : 'Lighter' in Statement (I) refers to the oil density, which may be adjusted by admixtures.

135. Statement (I) : Bernoulli's equation is applicable to any point in the flow field provided the flow is steady and irrotational.

Statement (II) : The integration of Euler's equation of motion to derive Bernoulli's equation involves the assumptions that velocity potential exists and that the flow conditions do not change with time at any point.

136. Statement (I) : A sloping glacis is always preferred over a horizontal bed for locating a hydraulic jump.

Statement (II) : The hydraulic jump is the best dissipator of energy of the flowing water.

137. Statement (I) : Anaerobic sludge digester, by itself, is considered to be the better method than other methods of sludge treatment.

Statement (II) : During Anaerobic sludge digestion, CH_4 is produced; also rodents and other pests are attracted when digester sludge is dried.

138. Statement (I) : A nomogram is a ready reckoner to compute any two hydraulic parameters like discharge, pipe diameter, pipe slope and flow velocity in the pipe if the other two are known.

Statement (II) : Hydraulic parameters can be determined by using Mannings or Chezy's formulae; and a Nomogram is an organized compilation of a number of such, varied computations.

139. Statement (I) : The field capacity of Municipal solid waste is the total moisture that can be retained in a waste sample against gravity.

Statement (II) : The field capacity of Municipal solid waste is of critical importance in determining the volume of leachate in landfills.

140. Statement (I) : Proximate analysis of MSW is carried out to determine moisture content, volatile matter, and fixed carbon.

Statement (II) : Ultimate analysis of MSW is carried out to determine the full range of chemical composition and the energy value.

141. Statement (I) : The impact of Green House Gas emission on the environment may comprise accelerated increase in global warming as well as a significant rise in mean sea levels.

Statement (II) : Green House Gas emission is responsible for decreased land masses, increased population densities and food shortages.

142. Statement (I) : The fundamental principle of surveying is 'to work from the whole to the part'.

Statement (II) : Working from the whole to the part ensures prevention of accumulation of possible errors in survey work over large areas.

143. Statement (I) : Compass survey is still used by Geologists to locate the magnetic ores.

Statement (II) : Local attraction causes errors in compass survey due to terrestrial features – either natural or man-made.

144. Statement (I) : PCA is a preferred raw material for construction of Bituminous pavements in areas of heavy rainfall.

Statement (II) : In PCA, no stripping is needed as there is improved binding; and thereby stability is also improved.

145. Statement (I) : Bituminous roads disintegrate even with light traffic, but such failures are not exclusively attributable to wrong surface treatment.

Statement (II) : Improper preparation of the subgrade and the foundation is often responsible for this disintegration.

146. Statement (I) : Cermet, as a refractory material (Clay 80% + Aluminium 20%), is used in the construction of rockets and jets.

Statement (II) : Cermet containing metals, which are stable at temperatures as high as 600°C, resists sudden shocks.

147. Statement (I) : Aluminium alloy with less than 6% copper is used in making automobile pistons.

Statement (II) : Duraluminium containing 4% copper has a high tensile strength and is well usable wherever alkaline environment is not present.

148. Statement (I) : There is no practical method of concrete mix design based on the specific surface of aggregates.

Statement (II) : Surface area of aggregates plays a vital role in achieving the right mix desired for a desired strength.

149. Statement (I) : Air seasoning of structural timber renders it more durable, tough and elastic.

Statement (II) : Air seasoning of timber is the most economical and eco-friendly method of treatment when time is not a constraining criterion.

150. Statement (I) : Lining of nuclear plants with specially heavy concrete is needed for shielding and protecting against several dangerous conditions.

Statement (II) : Limonite is one special type of aggregate possessing a high density.

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