17 PY 01

Booklet Series : **C**

PQR - 2017
CIVIL ENGINEERING

Time Allowed : 3 Hours]

[Maximum Marks : 190

DO NOT OPEN THE SEAL GIVEN ON THE RIGHT HAND SIDE UNLESS INSTRUCTED BY THE INVIGILATOR

The Question Paper will contain **150** questions and will have **3 Sections** as below :

	Section	No. of Questions	Marks
(a)	Part A	100	100
(b)	Part B	40	80
(c)	Part C - General Knowledge (Common Part of all Subjects)	10	10
	Total	**150 Questions**	**190 Marks**

INSTRUCTIONS TO THE CANDIDATES

1. Read carefully and comply.

2. Fill the details including Name of the Candidate, Register Number, Question Paper Booklet Series in the OMR Answer Sheet. If you fail to fill the details and sign as instructed correctly, you will be personally responsible for the consequences arising during the scanning of your Answer Sheet.

3. All the **150** questions are of MCQ (Multiple Choice Questions) type. For each Question you will find 4 possible answers marked by the letters A, B, C and D. You are to select only one correct answer and mark in OMR Answer Sheet as per the instructions given therein. In any case, choose only one answer for each question. There will be no negative marking for wrong answers.

4. In the OMR Answer Sheet for each and every question shade only one answer. If more than one answers are shaded that question will be rejected for valuation.

5. Indicate your answer by darkening the appropriate circle as per the instructions given in the OMR Answer Sheet otherwise his/her Answer Sheet is liable to be rejected. For marking answers use Blue or Black Ball Point Pen only. Ensure that you darken only one circle. Darken it completely and don't overlap with any other circle.

6. Don't mark anything (including marking like ✓, ⊙, □) in the question paper booklet other than space provided for this purpose. If you fail to follow this, you will be disqualified.

7. In any event of any mistake in any Questions, candidates will not be penalized. However, no corrections will be made in Questions during the Examination.

8. Use of Mobile Phone, Pager, Digital Diary or any other Electronic Instrument etc., is not allowed. Their use will result in disqualification.

9. No candidate should leave the Examination Hall before the final bell. The OMR Answer Sheet should be handed over to the invigilator before leaving the Examination Hall. **The candidate is allowed to take the Question Booklet and Carbon copy of the OMR Answer Sheet with Him/ Her after the examination.**

C

1. When the standard penetration test is carried out in a sandy soil below the water table, the water level in the borehole is always maintained :

   (A) Slightly above the ground water level

   (B) Slightly below the ground water level

   (C) At a depth of ground water level

   (D) None of the above

2. The degree of disturbance for a soil samples collected from the sampler is usually expressed by :

   (A) Void ratio   (B) Area ratio

   (C) Recovery ratio   (D) Consolidation ratio

3. The horizontal strain required to produce passive earth pressure condition in a cohesionless soil is :

   (A) More   (B) Less   (C) Very less   (D) Less than Zero

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4. The allowable bearing pressure is the maximum pressure that can be applied on the soil by satisfying the requirement of :

   (A) Settlement   (B) Shear

   (C) Both shear failure and settlement   (D) None of the above

5. The total vertical settlement of a rigid foundation under a pressure 'q' is taken to be _____ times the total vertical settlement at the centre of the flexible foundation. Choose the correct answer from those listed below.

   (A) 1.4   (B) 1.2   (C) 0.8   (D) 0.6

6. The transformation which will reduce the equation $x^2 \dfrac{d^2 y}{dx^2} - x\dfrac{dy}{dx} + y = \log x$ to a linear equation with constant coefficient is :

   (A) $x = t^2$ (B) $x = e^t$

   (C) $x = \sqrt{t}$ (D) $x = \log t$

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7. The analytic function which maps the angular region $0 \leq \theta \leq \pi/4$ onto the upper half plane is :

(A) Z^2

(B) $4Z$

(C) Z^4

(D) 4θ

8. If $2x - x^2 + ay^2$ is to be harmonic, then 'a' should be :

(A) 2

(B) 3

(C) 0

(D) 1

9. The grades in a short quiz in biology were 0, 1, 2, . . ., 10 points, depending on the number answered correctly out of 10 questions. The mean grade was 6.7 and the standard deviation was 1.2. If we assume the grades are normally distributed, then the percentage of students scoring 6 points is :

(A) 17%

(B) 23%

(C) 62%

(D) 27%

10. The value of $\int\limits_{0.2}^{1.4} (\sin x - \log x + e^x)\, dx$ using Simpson's $\dfrac{3}{8}^{th}$ rule is :

(A) 4.401

(B) 4.053

(C) 4.0698

(D) 4.083

11. Identify the suitable mineral which is responsible for expansive in nature of black cotton soil :

(A) Quartz

(B) Iron oxide

(C) Basalt

(D) Silica

12. A phenomenon involved in soil by losing it strength due to remoulding and increase in strength with passage of time is called :

(A) Sensitivity

(B) Thixotropy

(C) Activity

(D) Consistency index

13. When the water flows through the soil deposit exerts a drag force is called :

(A) Kinetic force
(B) Seepage force
(C) Negative force
(D) Effective force

14. The effective stress within a soil mass is mainly a function of the :

(A) Pore voids
(B) Void ratio
(C) Uplift force
(D) Particle contact force

15. The relative compaction corresponding to zero relative density is :

(A) 80%
(B) 50%
(C) 60%
(D) 70%

16. Shear stress across principal plane is :

(A) Twice the normal stress
(B) Equal to normal stress
(C) Half of normal stress
(D) Zero

17. Area of S.F. diagram between two points of a span represents :

(A) Change in S.F. between the points
(B) Change in B.M. between the two points
(C) Change in load between the two points
(D) Maximum S.F. between the points

18. The maximum shear stress is equal to the :

(A) sum of the principal stresses
(B) difference of the principal stresses
(C) half of the difference of the principal stresses
(D) half of the sum of the principal stresses

19. Angular twist in a solid circular shaft of diameter 'd' and length 'l' subjected to torque 'T' is θ. Angular twist, in another similar shaft of half of the length subjected to same Torque 'T', is :

(A) 0.25 θ   (B) 0.5 θ   (C) θ   (D) 2 θ

**20.** In a thin - walled T-section, the shear centre is located at the point shown is :

(A)

(B)

(C)

(D)
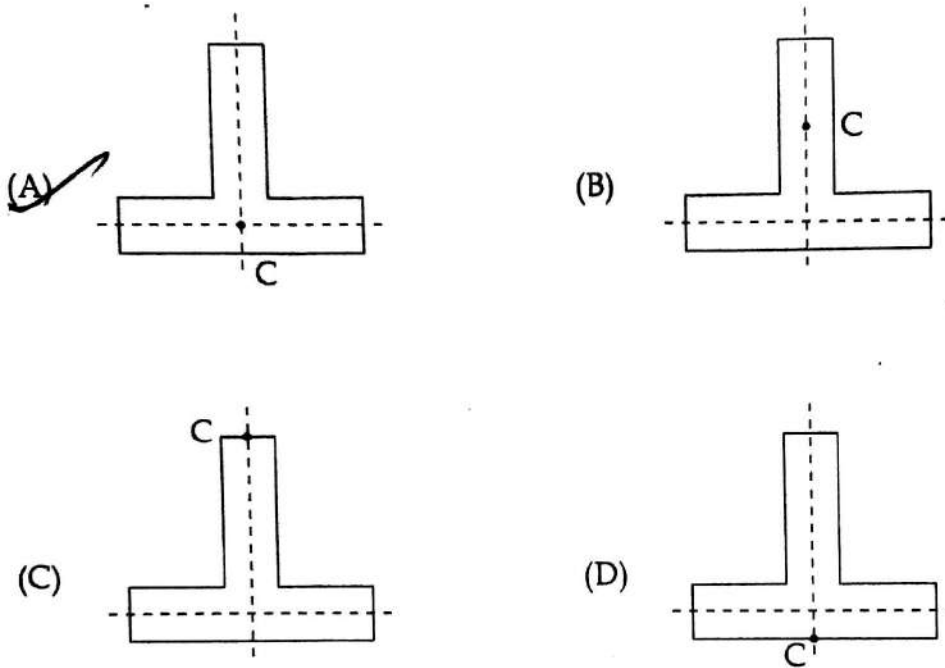
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21. The moment of inertia of a semicircular section about its centre of gravity parallel to *xx* axis is given by :
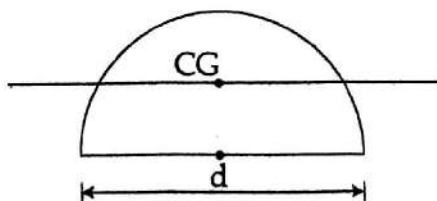
(A) 0.0032 d^4 (B) 0.0069 d^4 (C) 0.0089 d^4 (D) 0.0016 d^4

22. The principle of impulse and momentum is given by :

(A) Initial momentum + Impulse = Final momentum

(B) Initial momentum + Final momentum = Impulse created

(C) $\dfrac{\text{Initial momentum}}{\text{Final momentum}}$ = Impulse created

(D) Final momentum = Impulse × Initial momentum

23. The shear stress distribution across a symmetrical I section is given by :

(A)

(B)

(C)

(D)

6

C
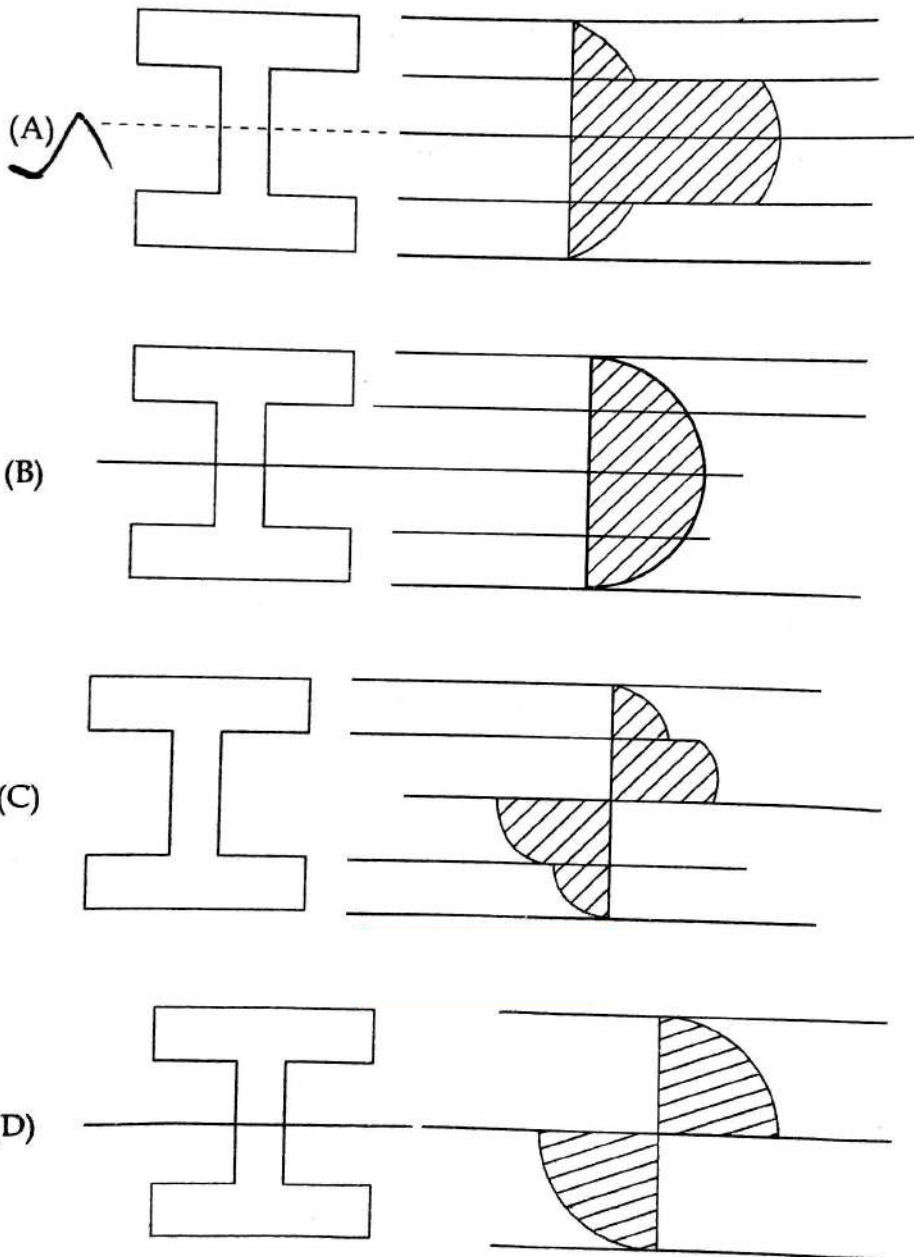
24. The weight of a hollow shaft shall be calculated using :

(A) $\rho g \left[\dfrac{\pi}{4}(D_o^2 - D_i^2) \times L\right]$

(B) $\rho g \left[\dfrac{\pi}{4}(D_o^2 + D_i^2) \times L\right]$

(C) $\dfrac{\rho g}{L}\left[\dfrac{\pi}{4}(D_o^2 - D_i^2)\right]$

(D) $\dfrac{\rho g}{L}\left[\dfrac{\pi}{4}(D_o^2 + D_i^2)\right]$

25. The tangential (or) shear stress on an oblique plane at an angle (θ) to the cross section of a body which is subjected to a direct tensile stress (σ) is equal to :

(A) $\sigma \cos^2 \theta$

(B) $\sigma \cos \theta$

(C) $\dfrac{\sigma}{2} \sin 2\theta$

(D) $\sigma \sin^2 \theta$

26. Bulking of sand is defined as :

(A) The mass of the sand in a given volume

(B) Rodding of sand so that it occupies minimum volume

(C) Increase in the volume of sand due to moisture which keeps sand particles apart

(D) The presence of air bubbles that increases the volume of sand

27. Addition of Flyash (or) Ground granulated blast furnace slag in the concrete composition may be taken into account :

(A) With respect to the cement content and water-cement ratio

(B) With respect to the water-cement ratio only

(C) With respect to the Aggregates and water-cement ratio

(D) With respect to the cement content only

28. An R.C.C beam not provided with shear reinforcement may leads to failure in its bottom inclined roughly to :

   (A) 60° to the horizontal

   (B) 30° to the horizontal

   (C) 45° to the horizontal

   (D) 25° to the horizontal

29. The effective span of a simply supported slab is :

   (A) Distance between the centres of the bearings

   (B) Clear distance between the inner faces of the walls plus twice the thickness of the wall

   (C) Clear span plus effective depth of the slab

   (D) Distance between outer faces

30. Soil liquefaction may occur due to :

   (A) Higher shear strength of soil

   (B) The liquid limit of the soil is less than 35%

   (C) The weight of the soil particles finer than 0.005 mm is less than 15% of the dry weight of the soil

   (D) Both (B) and (C)

31. In design of tension member, the length of the connection can be reduced by using :

   (A) Bearing stiffener

   (B) Splice plate

   (C) Lug angle

   (D) Guselted base

32. Lateral torsional buckling will occur in :

   (A) Beams whose compression flange is embedded in the slab

   (B) Beams which are laterally restricted by horizontal bracings

   (C) Beams which are laterally unsupported

   (D) Beams whose web are restrained by lateral beams

33. Bi-axial bending occurs in :

    (A) Purlin   (B) Beam   (C) Tension member   (D) Boom

34. Anchor bolts to resist over-turning moment are used in slab base :

    (A) When the column carries only moments

    (B) When the column carries axial load only

    (C) When the column carries axial load and moment

    (D) When the column carries no load

35. The highway bridges shall not be considered to be carrying any live load when the wind velocity at deck level exceeds :

    (A) 50 km/hr   (B) 70 km/hr   (C) 100 km/hr   (D) 130 km/hr

36. In case of circular arches, the following equation will be used :
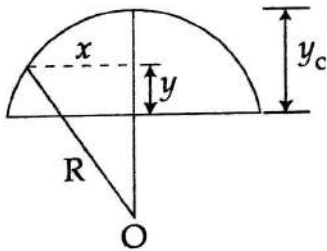
    (A) $R^2 = x^2 - (R - y_c + y)^2$ (B) $R^2 = x^2 + (R - y_c + y)^2$

    (C) $R^2 = x^2 + (R + y_c - y)^2$ (D) $R^2 = x^2 + (R - y_c - y)^2$

37. The fixed end moment at left end of a beam subjected to uniformly varying load of intensity 'q' at left end and zero intensity at right end is given by :

    (A) $\dfrac{-ql^2}{20}$ (B) $\dfrac{-ql^2}{30}$ (C) $\dfrac{-ql^2}{24}$ (D) $\dfrac{-ql^2}{16}$

38. The degree of redundancy of the structure shown is :
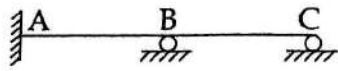
(A) 3   (B) 1   (C) 2   (D) 4

39. The equation for finding influence line diagram ordinate for reaction at propped end of a propped cantilever beam is ($n = x/l$) :

(A) $\dfrac{(n^3 - 5n)}{4}$ (B) $\dfrac{(n^3 - 3n)}{2}$ (C) $\dfrac{(n^3 - 3n + 2)}{2}$ (D) $\dfrac{(n^3 - 5n + 4)}{4}$

40. A simply supported beam is of rectangular section. It carries a uniformly distributed load over the whole span. The deflection at the centre is 'y'. If the depth of the beam is doubled, the deflection at centre will be :

(A) $2y$ (B) $4y$ (C) $y/8$ (D) $y/2$

41. A bolt subjected to combined Shear and Tension shall satisfy the following condition :

(A) $\left(\dfrac{T_b}{T_{db}}\right)^2 + \left(\dfrac{V_{sb}}{V_{db}}\right)^2 \leq 1.0$ (B) $\left(\dfrac{T_b}{T_{db}}\right)^2 + \left(\dfrac{V_{sb}}{V_{db}}\right)^2 \geq 1.0$

(C) $\left(\dfrac{T_{db}}{T_b}\right)^2 + \left(\dfrac{V_{db}}{V_{sb}}\right)^2 \leq 1.0$ (D) None of these

42. The maximum effective slenderness ratio for members always under tension (other than pre-tensioned members) is :

(A) 350   (B) 300   (C) 400   (D) 180

43. The thickness of battens shall be not less than :

(A) $\frac{1}{80}^{th}$ of the distance between the innermost connecting lines of rivets, bolts or welds

(B) $\frac{1}{50}^{th}$ of the distance between the innermost connecting lines of rivets, bolts or welds

(C) $\frac{1}{70}^{th}$ of the distance between the innermost connecting lines of rivets, bolts or welds

(D) None of the above

44. The economical depth (d) of the plate girder is :

(A) $\left(\frac{MK}{fy}\right)^{1/5}$
(B) $\left(\frac{MK}{fy}\right)^{1/3}$
(C) $\left(\frac{Mfy}{K}\right)^{1/5}$
(D) $\left(\frac{fyK}{M}\right)^{1/3}$

45. The web crippling strength is calculated as :

(A) $(b_1 + n_2) t_w \frac{fyw}{\gamma mo}$
(B) $fywt_w$

(C) $\frac{n_2 t_w}{\gamma mo}$
(D) None of the above

46. The Nagpur road plan formula were prepared assuming a shape of :

(A) Star and Square pattern
(B) Star and Grid pattern

(C) Star and Circular pattern
(D) Star and Rectangular pattern

47. Equation for the length of transition curve for plain and rolling terrain is :

(A) $Ls = 3.7\ V^2/R$
(B) $Ls = 4.7\ V^2/R$
(C) $Ls = 2.7\ V^2/R$
(D) $Ls = 1.7\ V^2/R$

48. The instantaneous speed of a vehicle at a specified location is :

  (A) High speed   (B) Slow speed   (C) Spot speed   (D) Over speed

49. The object of triaxial compression test is to determine the shear strength of soil under :

  (A) Lateral displacement

  (B) Longitudinal displacement

  (C) Lateral Confinement

  (D) Longitudinal confinement

50. The least count of standard vernier Theodolite is :

  (A) 40 seconds   (B) 30 seconds   (C) 10 seconds   (D) 20 seconds

51. Blaney - Criddle method is used to determine :

  (A) Evaporation

  (B) Consumptive use of crop

  (C) Infiltration

  (D) Interception

52. Storage capacity of a reservoir can be fixed by :

  (A) Mass curve method

  (B) Storage zones method

  (C) Dicken's formula

  (D) Ryve's formula

53. Crop period is the time a crop takes :

  (A) First time of watering to last watering

  (B) From sowing to its harvesting

  (C) From sowing to last watering

  (D) From first watering at the time of sowing to its harvesting

54. If pipes of different lengths and diameters are connected with one another to form a pipeline such a pipeline is called _____. If such a pipeline replaced by a single pipe of same diameter with a same rate of flow, loss of head and length is called _____.

   (A) Compound pipe and Pipe in series

   (B) Compound pipe and Equivalent pipe

   (C) Pipes in series and Compound pipe

   (D) Pipes in series and Uniform pipe

55. Specific speed of a turbine can be calculated using the formula :

   (A) $N_S = \left[\dfrac{\pi DN}{60}\right]$ (B) $N_S = \left[\dfrac{N.\sqrt{P}}{H^{3/4}}\right]$ (C) $N_S = \left[\dfrac{\pi DNT}{4500}\right]$ (D) $N_S = \left[\dfrac{N.\sqrt{P}}{H^{(5/4)}}\right]$

56. Water supply projects, under normal circumstances may be planned for a Design period of :

   (A) 10 years   (B) 20 years   (C) 30 years   (D) 50 years

57. The settling velocity of a spherical particle is expressed by :

   (A) Newton's law   (B) Law of conservation of mass

   (C) Stoke's law   (D) Law of conservation of momentum

58. Temporary Hardness is due to presence of :

   (A) sulphates of Calcium and Magnesium

   (B) chlorides of Calcium and Magnesium

   (C) nitrates of Calcium and Magnesium

   (D) bicarbonates of Calcium and Magnesium

59. The most common artificial Zeolite is :

(A) Lime (B) Soda ash (C) Permutit (D) Sodium chloride

60. In air pollution, PAN is :

(A) peroxy acetyl nitride (B) peroxy acetyl nitrite

(C) peroxy acetyl nitrate (D) None of the above

61. If the temperature of a sedimentation tank is increased, the sedimentation speed will :

(A) get hastened (B) get slowed down

(C) not be affected at all (D) none of the above

62. The suitable layout for a water supply distribution system, for a city of roads of rectangular pattern, is :

(A) Dead end system (B) Grid iron system

(C) Ring system (D) Radial system

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

(A) House sewer (B) Main Sewer

(C) Out fall sewer (D) None of these

64. A gully trap is provided at the junction of :

(A) a house sewer and a municipal sewer

(B) an unfoul roof or room drain and a foul bath or a kitchen drain

(C) any two house drains

(D) none of these

65. Eutrophication of water bodies is caused by the :

(A) discharge of toxic substances

(B) excessive discharge of nutrients

(C) excessive discharge of suspended solids

(D) excessive discharge of solids

66. The Final moment at the end A, in a beam AB due to rotations θ_A, θ_B and downward settlement of support at B is given by :

(A) $M_{AB} = M_{FAB} + \dfrac{2EI}{l}\left[2\,\theta_A + \theta_B - \dfrac{3\delta}{L}\right]$

(B) $M_{AB} = M_{FAB} - \dfrac{2EI}{l}\left[2\,\theta_A + \theta_B - \dfrac{3\delta}{L}\right]$

(C) $M_{AB} = M_{FAB} + \dfrac{4EI}{l}\left[2\,\theta_A + \theta_B - \dfrac{3\delta}{L}\right]$

(D) $M_{AB} = M_{FAB} + \dfrac{2EI}{l}\left[\theta_A + 2\theta_B - \dfrac{3\delta}{L}\right]$

67. A Two - hinged semi circular arch of radius R carries a concentrated load 'W' at the crown. The horizontal thrust at each support is given by, assume EI = constant :

(A) $H = \dfrac{W}{2\pi}$ (B) $H = \dfrac{2}{3}\dfrac{W}{\pi}$ (C) $H = \dfrac{W}{\pi}$ (D) $H = \dfrac{W}{4\pi}$

68. The influence line diagram for force in member XY of the trum shown in fig will be :

Panels at 4m each = 24 m

(A) 3/6, 2/6

(B) 1

(C) 4/3

(D) 3/2
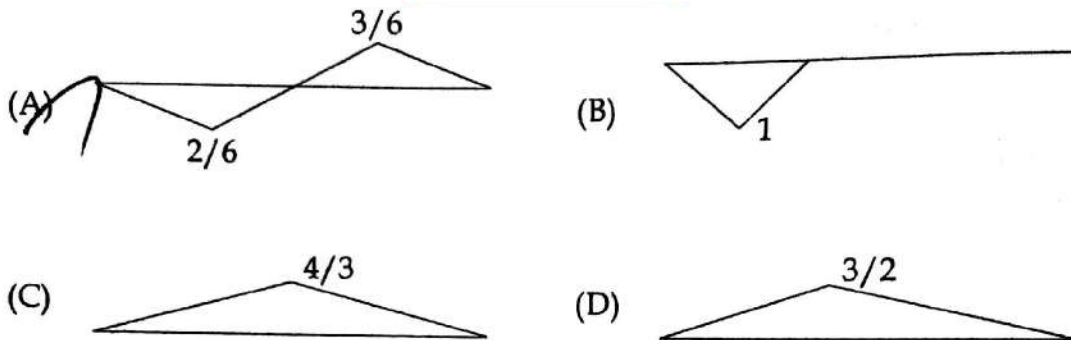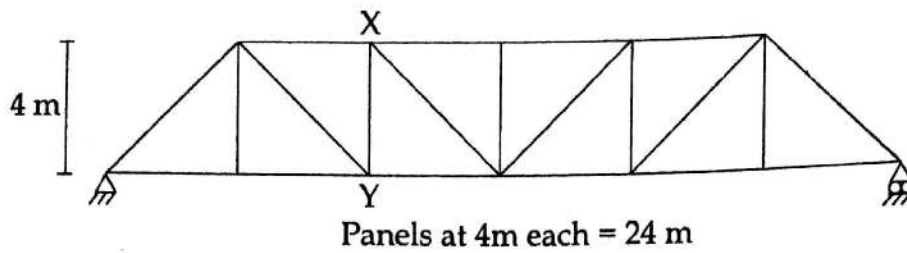
69. A cantilever of span '*l*' carries a load '*W*' at the free end. The flexibility of the beam is given by :

(A) $\dfrac{L^2}{3\,EI}$

(B) $\dfrac{L^3}{3\,EI}$

(C) $\dfrac{L}{3\,EI}$

(D) $\dfrac{L^3}{8\,EI}$

70. Flexibility matrix for a beam element is $[F] = \dfrac{1}{EI}\begin{bmatrix} 6 & 2 \\ 2 & 9 \end{bmatrix}$. What is the corresponding stiffness matrix $[S]$?

(A) $S = \dfrac{EI}{50}\begin{bmatrix} 9 & -2 \\ -2 & 6 \end{bmatrix}$

(B) $S = \dfrac{EI}{50}\begin{bmatrix} 6 & -2 \\ -2 & 9 \end{bmatrix}$

(C) $S = \dfrac{EI}{50}\begin{bmatrix} 2 & 9 \\ 6 & 2 \end{bmatrix}$

(D) $S = \dfrac{EI}{50}\begin{bmatrix} 6 & 2 \\ 9 & 2 \end{bmatrix}$

71. Choose the incorrect relationship :

(A) $\gamma_d = (1-n) G \gamma_w$

(B) $S = \dfrac{w}{\gamma_w / \gamma_{(1+w)} - \dfrac{1}{G}}$

(C) $n_a = \dfrac{1+e}{e(1-s)}$

(D) $w = \dfrac{1 - \dfrac{G_m}{G_s}}{G_m / s - 1}$

(notations are as usual)

72. Inverse of Relative density of soil is :

(A) $\dfrac{e_{max} - e_{nat}}{e_{max} - e_{min}} \times 100\%$

(B) $\dfrac{e_{max} - e_{min}}{e_{max} - e_{nat}} \times 100\%$

(C) $\dfrac{e_{nat} - e_{max}}{e_{max} - e_{min}} \times 100\%$

(D) $\dfrac{e_{max} - e_{min}}{e_{nat} - e_{max}} \times 100\%$

73. For seepage in anisotropic soil conditions, scale transformation is used to obtain standard laplace equation. Then flow net is drawn for transformed section, by :

(A) Increasing horizontal dimension by $\sqrt{k_x k_z}$

(B) Shortening horizontal dimension by $\sqrt{k_x k_z}$

(C) Increasing horizontal dimension by $\sqrt{\dfrac{k_z}{k_x}}$

(D) Shortening horizontal dimension by $\sqrt{\dfrac{k_z}{k_x}}$

74. Dimensional unit of co-efficient of consolidation is :

(A) $L^2 T^{-1}$

(B) $L^{-1} T^2$

(C) $L^3 T$

(D) $L T^{-3}$

75. Relationship between settlement (S_f) of a foundation width (B_f) and settlement (S_p) of test plate width (B_p), as per as Terzaghi and peck is concerned, is :

(A) $\dfrac{S_f}{S_p} = \left[\dfrac{B_p(B_p+30)}{B_f(B_f+30)}\right]^2$

(B) $\dfrac{S_f}{S_p} = \dfrac{B_p^2}{B_f^2}$

(C) $\dfrac{S_f}{S_p} = \left[\dfrac{B_f(B_p+30)}{B_p(B_f+30)}\right]^2$

(D) $\dfrac{S_f}{S_p} = \left[\dfrac{B_p+30}{B_f+30}\right]^2$

76. Two cars are approaching each other from opposite directions at 100 km/h and 80 km/h respectively. The reaction time of each driver is 2.5 seconds and the coefficient of friction is 0.35. The stopping sight distance required in order to avoid head on collision of two cars will be :

(A) 128 m   (B) 182 m   (C) 218 m   (D) 310 m

77. Which of the following bituminous binder is most suitable in cold - mix macadam and bituminous carpets at summer and winter temperatures, both in plains and in high altitudes ?

(A) Emulsions

(B) Cut back RC - 3

(C) 60/70 Penetration grade

(D) 180/200 Penetration grade

78. In trial cycle method, the green period G_1 can be expressed as :

(A) $\dfrac{2.5\,n_1\,C_1}{900}$

(B) $\dfrac{3.5\,n_1\,C_1}{600}$

(C) $\dfrac{900\,n_1\,C_1}{2.5}$

(D) $\dfrac{600\,n_1\,C_1}{2.5}$

79. Locality map - cum - site plan is a :

(A) Combination of the key map to a scale of 1 : 250,000 and the index map to a scale of 1 : 50,000

(B) Combination of the key map to a scale of 1 : 50,000 and the index map to a scale of 1 : 20,000

(C) Combination of the key map to a scale of 1 : 20,000 and the index map to a scale of 1 : 10,000

(D) Combination of the key map to a scale of 1 : 150,000 and the index map to a scale of 1 : 25,000

80. The provided super elevation is said to be equilibrium super-elevation, if :

(A) Pressure on the inner wheel is more than that on the outer wheel

(B) Coefficient of friction is zero

(C) The rate of super-elevation is very small

(D) The acceleration of the vehicle is negligible

81. The critical specific energy for a flow of 12 m³/s in a rectangular channel of width 3.5 m and energy coefficient 1.1 will be :

(A) 3.127 m   (B) 1.645 m   (C) 1.345 m   (D) 1.096 m

82. A smooth stationary flat plate is held at θ° to the direction of the jet. After striking the plate the jet gets divided into two streams Q_1 upwards and Q_2 downwards. The ratio of $\dfrac{Q_1}{Q_2}$ is :

(A) $\dfrac{1 - \cos\theta}{1 + \cos\theta}$ (B) $\dfrac{1 + \cos\theta}{1 - \cos\theta}$ (C) $\dfrac{1 - \sin\theta}{1 + \sin\theta}$ (D) $\dfrac{1 + \sin\theta}{1 - \sin\theta}$

83. The highest water saving method of irrigation is :

(A) sprinkler   (B) drip   (C) sub-surface   (D) basin

84. Pressure inside water droplet is _____ if the surface tension is 'σ' and diameter is 'd'.

(A) $\dfrac{3\,\sigma}{d}$ (B) $\dfrac{4\,\sigma}{d}$ (C) $\dfrac{8\,\sigma}{d}$ (D) $\dfrac{16\,\sigma}{d}$

85. The dimensions of pressure is :

    (A) $ML^{-1}T^{-1}$ (B) $ML^{-1}T^{-2}$ (C) $ML\,T^{-1}$ (D) L^2T^{-1}

86. If $A = \begin{pmatrix} -2 & 0 & 5 \\ 0 & 3 & -11 \\ 0 & 0 & 1 \end{pmatrix}$, then the eigenvalues of A^3 are :

    (A) 2, 5, 7   (B) $-4, 9, 1$ (C) $-8, 27, 1$ (D) $-\dfrac{1}{2}, \dfrac{1}{3}, 1$

87. If $A = \begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix}$, then A^n is :

    (A) $\begin{pmatrix} 1+2n & -4n \\ n & 1-2n \end{pmatrix}$ (B) $\begin{pmatrix} 3^n & (-4)^n \\ 1 & (-1)^n \end{pmatrix}$

    (C) $\begin{pmatrix} 1+3n & 1-2n \\ 1-n & 1+n \end{pmatrix}$ (D) $\begin{pmatrix} 1+2n & -4n \\ 1+n & 1-n \end{pmatrix}$

88. If $A = \begin{pmatrix} 1 & -11 & \frac{1}{2} \\ 0 & 2 & 5 \\ 0 & 0 & 3 \end{pmatrix}$, then a matrix similar to A is :

    (A) $\begin{pmatrix} \frac{1}{2} & 0 & 0 \\ -1 & 0 & 2 \\ 0 & 0 & 1 \end{pmatrix}$ (B) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 5 \\ -9 & 1 & 11 \end{pmatrix}$

    (C) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$ (D) $\begin{pmatrix} -11 & 1 & 0 \\ \frac{1}{2} & 0 & 3 \\ 0 & 5 & 1 \end{pmatrix}$

89. For what value of the constant 'a' the vector field $\vec{V}=(axy-z^3)\hat{i}+(a-2)x^2\hat{j}+(1-a)xz^2\hat{k}$ is irrotational ?

(A) 4   (B) 5   (C) -2 (D) 7

90. The solution of the differential equation $y(\log y)dx+(x-\log y)dy=0$ is :

(A) $x=\sin y+c\log(\cos y)$ (B) $x=\dfrac{1}{2}\log y+c\,(\log y)^{-1}$

(C) $x=\log y+c\sin y$ (D) $x=ay+cy\sqrt{1-y^2}$

91. The area ratio of core cutter sampler having inner diameter 150 mm and outer diameter 165 mm respectively is :

(A) 17.35%   (B) 12.8%   (C) 112%   (D) 21%

92. For a base failure of a finite slope the depth factor :

(A) $D_f=1$ (B) $D_f<1$

(C) $D_f>1$ (D) None of the above

93. The coefficient of earth pressure at rest for a sand having the Poisson's ratio value of 0.25 is :

(A) 1   (B) 3   (C) 1/3   (D) 1/2

94. Trapezoidal combined footing is specifically adopted when :

(A) two column loads are close

(B) the interior column carries more load

(C) columns are close to property line

(D) the exterior column carries more load than the interior column

95. Pick up the incorrect statement on dynamic pile driving formulae from the following :

(A) In Hiley's formulae a number of constants are involved, which are difficult to determine

(B) The formulae do not take into account the reduced bearing capacity of pile when in group

(C) Dynamic formulae are best suited to coarse grained soils for which shear strength is independent of rate of loading

(D) Law of impact used for determining energy loss is strictly valid for piles, subjected to restraining influence of the surrounding soil

96. Autoclave method is used to determine :

(A) Residue

(B) Expansion

(C) Heat of hydration

(D) Sulpher Content

97. Under service loads the crack width in concrete should not exceed under mild exposure as per IS 456 is :

(A) 0.1 mm

(B) 0.3 mm

(C) 0.2 mm

(D) 0.4 mm

98. The live load for the design of staircases as per IS 875 (1964) for public buildings liable overcrowding is :

(A) 2 KN/m^2

(B) 3 KN/m^2

(C) 4 KN/m^2

(D) 5 KN/m^2

99. The maximum shear stress occurs at the outside radius and equals :

(A) $\tau_{max} = \dfrac{2R}{\pi T^2}$

(B) $\tau_{max} = \dfrac{2R}{\pi T^3}$

(C) $\tau_{max} = \dfrac{2T}{\pi R^2}$

(D) $\tau_{max} = \dfrac{2T}{\pi R^3}$

100. For ordinary Portland Cement the specific surface is not less than :

(A) 2350 cm^2/g (B) 2250 cm^2/g (C) 2450 cm^2/g (D) 2550 cm^2/g

101. The crippling load taken by a column with both ends hinged is 100 kN. The crippling load taken by the same column with one end fixed and other end free will be :

(A) 400 kN (B) 100 kN (C) 50 kN (D) 25 kN

102. A bar having a cross - sectional area of 700 mm^2 is subjected to axial loads at the positions indicated in figure. The value of stress in the segment QR is :
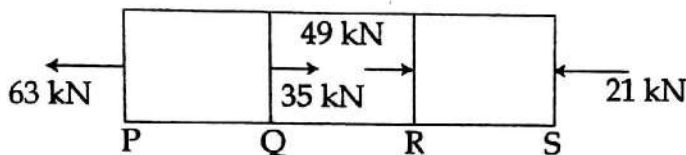
(A) 40 MPa (B) 50 MPa (C) 70 MPa (D) 120 MPa

103. Fig shows the state of stress at a certain point in a stressed body. The magnitudes of normal stresses in the x and y directions are 100 MPa and 20 MPa respectively. The radius of Mohr's stress circle representing this state of stress is :
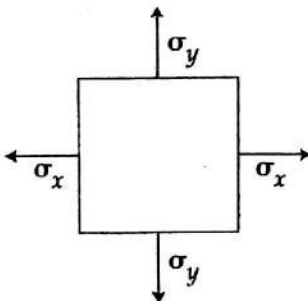
(A) 120 (B) 80 (C) 60 (D) 40

104. The maximum deflection in 'm' in a simply supported beam of span 10 m subjected to a central point load of 100 kN is :

$(EI = 2 \times 10^4 \text{ kN} - \text{m}^2)$

(A) $\dfrac{10}{48}$

(B) $\dfrac{10}{96}$

(C) $\dfrac{10}{192}$

(D) $\dfrac{10}{16}$

105. The influence line diagram for bending moment at 6m is shown. The value of maximum bending moment is :

200 kN 100 kN
6m   3m   6m
3.6
2.4
ICD for BM at 6m
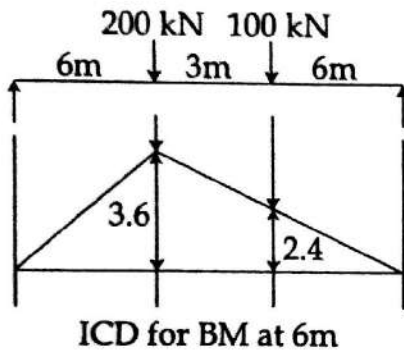
(A) 960 kN - m

(B) 800 kN - m

(C) 660 kN - m

(D) 540 kN - m

106. The diameter of a pipe is 200 mm. The velocity of flow through the pipe is 4 m/s. The discharge through the pipe is :

(A) 127.60 l.p.s

(B) 126.60 l.p.s

(C) 130.60 l.p.s

(D) 125.60 l.p.s

107. A river has an average surface width of 20 m. If the evaporation measured in the vicinity of the river is 0.5 mm/day, the volume of water evaporated in 60 km stretch of the river in a month of 30 days in m³ is :

(A) 1800

(B) 180

(C) 18000

(D) 18

C

108. A city supply of 15000 cubic metres of water per day is treated with a chlorine dosage of 0.5 ppm. For this purpose, the requirement of 25% bleaching powder per day would be :

(A) 300 kg   (B) 75 kg   (C) 30 kg   (D) 750 kg

109. Two pipe system of providing building drainage consists of :

(A) One soil pipe + One waste pipe + One vent pipe + One sullage pipe

(B) One soil pipe + One waste pipe + two vent pipes

(C) two soil pipes + two waste pipes

(D) two soil pipes only

110. As per IS code, the desirable value of Nitrate in drinking water is :

(A) 50 mg/l   (B) 45 mg/l   (C) 55 mg/l   (D) 40 mg/l

111. An embankment is proposed to construct on 10m thick clay deposit having the coefficient of volume compressibility as 2.7×10^{-4} m²/kN. Determine the settlement of clay by the increase in vertical stress of 60 kN/m² due to the construction of embankment.

(A) 162 mm   (B) 160 mm   (C) 164 mm   (D) 163 mm

112. A 600 mm square bearing plate settles by 15 mm in plate load test on a cohesionless soil under an intensity of loading 0.2 N/mm². The settlement of a prototype shallow footing 1 m square under the same intensity of loading is :

(A) 15 mm

(B) between 15 mm and 25 mm

(C) 25 mm

(D) greater than 25 mm

113. A wooden pile is being driven with a drop hammer weighing 20 kN and having a free fall of 1.0 m . The penetration in the last blow is 5 mm. The load carrying capacity of the pile as per engineering news Formula is :

(A) 33.33 kN

(B) 66.66 kN

(C) 222.2 kN

(D) 111.1 kN

114. If a two - dimensional velocity potential function is given by $\phi = 3xy$, the discharge between the stream lines passing through (2, 6) and (6, 6) will be :

(A) 14.68 units

(B) 18.97 units

(C) 25.45 units

(D) 48 units

115. An unconfined aquifer of 50 m thickness has K = 30 m/day completely penetrates a well of radius 0.5 m. The well is pumped so that the water level in the well remains at 40 m above the bottom. If the pumping has no effect on water table at r = 500 m, the steady state discharge would be :

(A) 122.80 litres/s
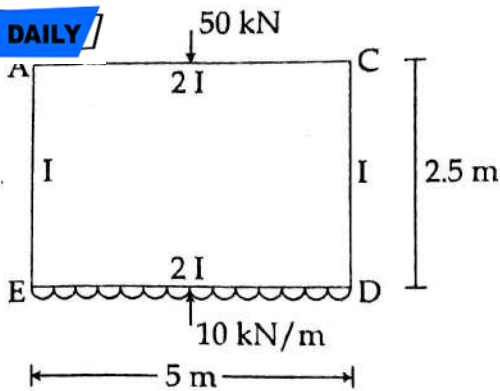
(B) 142.12 litres/s

(C) 225.16 litres/s

(D) 386.52 litres/s

116. The slope deflection equation at B of member BC for the frame shown in the figure is _____. (Take EI = constant)
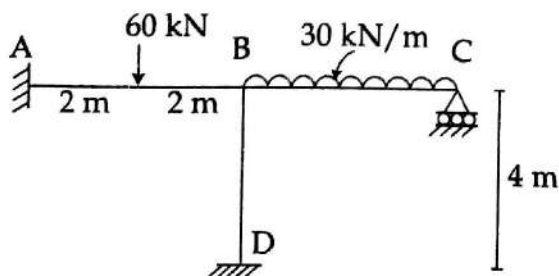
(A) $MBC = 60 + EI\theta_B$

(B) $MBC = -40 + 0.5EI\theta_B + EI\theta_C$

(C) $MBC = -40 + EI\theta_B + 0.5EI\theta_C$

(D) $MBC = -60 + EI\theta_B$

117. The distribution factors for members AE and AC of the box section are :

50 kN

A
2 I
C

I
I
2.5 m

2 I
E
D

10 kN/m

5 m

(A) 0.5 and 0.5   (B) 0.25 and 0.75   (C) 0.6 and 0.4   (D) 0.63 and 0.37

118. Which of the following statements in terms of compound composition of cement are incorrect ?

(A) C_3S and C_2S together constitute about 70% to 80% of cement

(B) C_2S hydrates slowly and provides much of the ultimate strength

(C) C_3S having the faster rate of reaction is accompanied by greater heat evolution

(D) C_3S provides more resistance to chemical attack

119. A Rectangular beam has b = 250 mm, d = 500 mm, Ast = 3 NB 20 mm, fck = 20 N/mm^2 and Fe 415 steel are used. The limit moment capacity of the beam is :

(A) 4.433×10^8 N.mm   (B) 3.433×10^8 N.mm

(C) 1.433×10^8 N.mm   (D) 2.433×10^8 N.mm

120. For a continuous slab of 3 m × 3.5 m size, the minimum overall depth of slab to satisfy vertical deflection limits is :

(A) 50 mm   (B) 75 mm   (C) 100 mm   (D) 120 mm

121. Soil test results indicates liquid limit 34%, Plastic limit 20%, % passing through 75 μ sieve is 80%, % of gravel 0% and % of sand 20%. Classify the soil as per Indian Standard Soil classification :

(A) CH
(B) SP - CI
(C) CL - CI
(D) SP - CL

122. The particle size corresponding to 10% finer of sand is 0.3 mm. Estimate the coefficient of permeability :

(A) 0.1 cm/sec
(B) 0.09 cm/sec
(C) 0.37 cm/sec
(D) 1.0 cm/sec

123. A masonary dam has pervious sand as foundation. Determine the maximum permissible upward gradient if factor of safety at 3 is required against boiling ? For the sand n = 45% and G = 2.65.

(A) 0.1
(B) 0.3
(C) 0.5
(D) 0.7

124. A clay soil, tested in a consolidometer, showed a decrease in void ratio from 1.20 to 1.10 upm application of pressure 0.25 to 0.5 Kgf/cm². If the sample tested at the size was taken from a clay layer 3 m in thickness, then consolidation settlement is :

(A) 0.136 m
(B) 0.145 m
(C) 0.175 m
(D) 0.081 m

125. An excavation is to be made up to a depth of 6 m in cohesive soil having an unit weight of 20 kN/m³, what is the required cohesive strength of clay to keep the sides of earth remains vertical without any support.

(A) 29.3 kN/m²
(B) 28.9 kN/m²
(C) 30.0 kN/m²
(D) 31.0 kN/m²

126. According to ISI recommendations, the maximum depth of stress block for balanced section of a beam of effective depth 'd' is :

(A) 0.43 d   (B) 0.55 d   (C) 0.68 d   (D) 0.85 d

127. A propped cantilever beam of span 'L' and constant plastic moment capacity Mp carries a concentrated load at midspan, then load at collapse will be :

(A) $\dfrac{8Mp}{L}$ (B) $\dfrac{6Mp}{L}$ (C) $\dfrac{4Mp}{L}$ (D) $\dfrac{2Mp}{L}$

128. Determine the economical depth of the welded plate girder of span 24 m to carry super imposed load of 35 kN/m. Avoid stiffeners and use Fe 415 steel :

(A) 1000 mm   (B) 800 mm   (C) 1400 mm   (D) 1200 mm

129. A tension member consists of two angles $60 \times 60 \times 8$ the angles being placed back to back on the same side of the gusset plate. One leg of each angle is connected to the gusset plate. The outstanding legs are also connected by tack rivets. Find the safe tension for the member. Use 16 mm diameter rivet.

(A) 196.56 kN   (B) 203.45 kN   (C) 156.56 kN   (D) 208.61 kN

130. The sliding end of a roof trun rests on brick wall through a concrete pad. The maximum normal reaction on the bearing is 125 kN. The principal rafter is inclined at 30° to the main tie which one is horizontal. What will be the factored force in the principal rafter ?

(A) 250 kN   (B) 375 kN   (C) 62.5 kN   (D) 216.5 kN

131. The eigenvectors of the matrix $M = \begin{pmatrix} 4 & 3 \\ 2 & 9 \end{pmatrix}$ are :

(A) $\begin{pmatrix} 1 \\ 1 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix}$ (B) $\begin{pmatrix} 2 \\ 2 \end{pmatrix}, \begin{pmatrix} -1 \\ 3 \end{pmatrix}$ (C) $\begin{pmatrix} 1 \\ 2 \end{pmatrix}, \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ (D) $\begin{pmatrix} -1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix}$

132. The maximum and minimum values of $f(x) = 3x^4 - 2x^3 - 6x^2 + 6x + 1$ in the interval $(0, 2)$ are :

(A) $2\frac{7}{16}, -2$

(B) $2\frac{7}{16}, 2$

(C) $31, -1$

(D) $5\frac{3}{4}, 2$

133. Taylor series expansion of $\dfrac{1}{z-2}$ in $|z| < 1$ is :

(A) $\dfrac{1}{2} + \dfrac{3}{4}z + \dfrac{7}{8}z^2 + \ldots$

(B) $\dfrac{1}{4}z\left\{1 + \dfrac{1}{z} + \dfrac{1}{z^2} + \ldots\right\}$

(C) $\dfrac{1}{z-2} + \dfrac{2}{(z-2)^2} + \dfrac{3}{(z-2)^3} + \ldots$

(D) $-\dfrac{1}{2}\left\{1 + \dfrac{z}{2} + \dfrac{z^2}{4} + \dfrac{z^3}{8} + \ldots\right\}$

134. Using Runge - Kutta method of order 4, the value of $y(0.1)$ for $y' = xy + y^2$, $y(0) = 1$, taking $h = 0.1$, is :
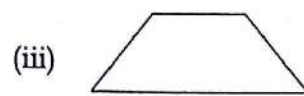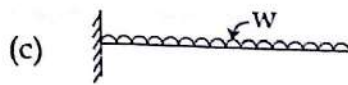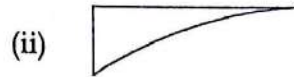
(A) 1.1169

(B) 1.1152

(C) 1.1172

(D) 1.1139

135. Match the following beams with their bending moment diagrams :
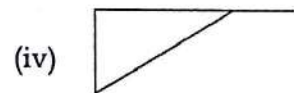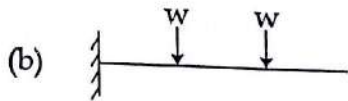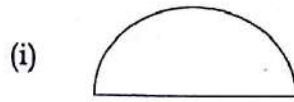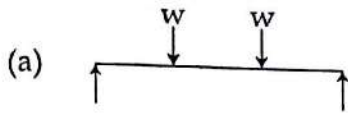
Codes :

	(a)	(b)	(c)	(d)
(A)	(i)	(iii)	(iv)	(ii)
(B)	(iii)	(iv)	(ii)	(i)
(C)	(iv)	(iii)	(i)	(ii)
(D)	(i)	(ii)	(iii)	(iv)

136. A 1 % of sewage sample is incubated for 5 days at 20°C. The depletion of Oxygen was found to be 3 ppm. The B.O.D of Sewage is :

(A) 100 ppm   (B) 150 ppm   (C) 300 ppm   (D) 600 ppm

137. If V is the design speed in km/hr and 't' is the total reaction time. The lag distance will be :

(A) 0.378 V.t. meters   (B) 0.178 V.t. meters

(C) 0.278 V.t. meters   (D) 0.478 V.t. meters

138. The Equation for computing the velocity of flow by Manning's formula is :

(A) $V = \dfrac{1}{n} R^{1/2} . S^{2/3}$

(B) $V = \dfrac{1}{n} R^{3/4} . S^{1/2}$

(C) $V = \dfrac{1}{n} R^{2/3} . S^{1/2}$

(D) $V = \dfrac{1}{n} R^{1/2} . S^{3/4}$

139. Match the items in **List - A** with items in **List - B** and choose the correct answer choice given below the lists :

List - A	List - B
(Crack type)	**(Cause)**
(a) Alligator crack	(i) Brittleness due to aging of binder
(b) Shrinkage crack	(ii) Brittleness and overheating of bitumen .
(c) Sympathetic crack	(iii) Insufficient bitumen content
(d) Hair line crack	(iv) joints and cracks on pavement layers underneath

Codes :

	(a)	(b)	(c)	(d)
(A)	(iv)	(i)	(ii)	(iii)
(B)	(ii)	(i)	(iv)	(iii)
(C)	(ii)	(iv)	(i)	(iii)
(D)	(ii)	(iv)	(iii)	(i)

140. A traffic lane has one way traffic flow at a stream speed of 40 Kmph. The average space gap between vehicles to follow 0.278 Vt. Assuming the average reaction time as 0.7 sec and average length of vehicle as 5 m, the theoretical capacity calculated with above data in vehicles per hour per lane will be :

(A) 2170   (B) 2350   (C) 2840   (D) 3130

C

141. What temperature are Fahrenheit and Celsius equal ?

(A) $-40°$ (B) 574.59   (C) 40   (D) -574.59

142. Who won the gold both in the 5,000 and 10,000 metres event in 2017 Asian Athletics Championship ?

(A) Lakshmanan

(B) Gopi Thonkanal

(C) Jinson Johnson

(D) Neeraj Chopra

143. The parliament can make any law for whole or any part of India for implementing international treaties :

(A) with the consent of all the states

(B) with the consent of the majority of states

(C) with the consent of the states concerned

(D) without the consent of any state ·

144. Consider the following rivers :

(a) Narmada

(b) Brahmaputra

(c) Godavari

(d) Tapti

Which of the above is/are flowing into the Bay of Bengal ?

(A) (a), (b) and (c) only

(B) (b) and (c) only

(C) (a) and (b) only

(D) (a) and (c) only

145. Article 21-A and the RTE Act came into effect :

(A) On 1st April 2010

(B) On 1st April 2009

(C) On 1st April 2017

(D) On 1st April 2005

146. First state to fix minimum education qualification for cooperative body poll :

(A) Rajasthan   (B) West Bengal   (C) Tamil Nadu   (D) Karnataka

147. In a class of 45 students, a boy is ranked 20th. When two boys joined, his rank was dropped by one. What is his new rank from the end ?

(A) 25th (B) 26th (C) 27th (D) 28th

148. In which of the following temple, the front Mandapam is in the form of a huge chariot drawn by horses ?

(A) Patteswaram temple

(B) Darasuram temple

(C) Thanjavur Brihadeeswarar temple

(D) Thiruvarur Thyagaraja temple

EXAMS DAILY

149. Who wrote the novel - 'KavalKottam' ?

(A) Vannadasan   (B) S. Venkatesan   (C) Joe D Cruz   (D) Puviarasan

150. Quit India Movement was launched in response to :

(A) Cabinet Mission plan   (B) Cripps proposals

(C) Simon Commission Report   (D) Wavell plan

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