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Notations :

- 1.Options shown in green color and with ✓ icon are correct.
- 2.Options shown in red color and with ✗ icon are incorrect.

Question Paper Name :	PaperIII Civil Engineering 22nd August 2023 Shift 2
Subject Name :	Paper III Civil Engineering
Actual Answer Key :	Yes
Calculator :	None
Magnifying Glass Required? :	No
Ruler Required? :	No
Eraser Required? :	No
Scratch Pad Required? :	No
Rough Sketch/Notepad Required? :	No
Protractor Required? :	No
Show Watermark on Console? :	Yes
Highlighter :	No
Auto Save on Console?	Yes
Change Font Color :	No
Change Background Color :	No
Change Theme :	No
Help Button :	No
Show Reports :	No
Show Progress Bar :	No
Is this Group for Examiner? :	No
Examiner permission :	Cant View
Show Progress Bar? :	No

Paper III Civil Engineering

Section type :	Online
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Is Section Default? :	null

Question Number : 1 Question Id : 630680320258 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the flexural strength of a plate girder the following assertion and reason statements, which of the options is correct?

Assertion (A) :The flexural strength of a plate girder is based on tension flange yielding or compression flange buckling.

Reason (R) :The buckling strength of compression flange is governed by local buckling or lateral torsional buckling of flange.

Options :

1. ✓ Both A and R are true, and R is the correct explanation of A.
2. ✗ Both A and R are true, but R is not the correct explanation of A.
3. ✗ A is true, but R is false.
4. ✗ Both A and R are false.

Question Number : 2 Question Id : 630680320259 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Among the following members of a roof truss, identify the members which are subjected to compressive forces.

P - Principal rafter
T - Tie
S - Strut
L - Sling

Use codes for answering.

Options :

1. ✓ P and S only
2. ✗ T and L only

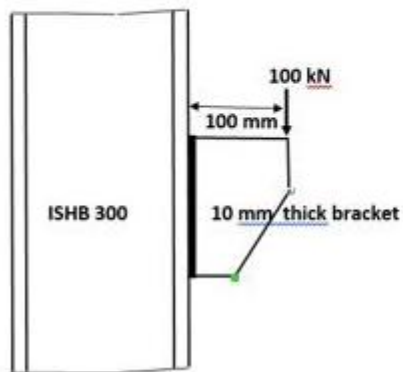
3. ✘ L only

4. ✘ P, T and L only.

Question Number : 3 Question Id : 630680320260 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The figure shows a welded bracket connection (bracket plate of depth d and thickness = 10 mm connected to a column flange by welded connection). The weld in this case is subjected to effects :



Options :

1. ✘ Torsion only

2. ✘ Direct shear stress only

3. ✔ Bending stress and Direct shear stress

4. ✘ Direct shear stress and torsion

Question Number : 4 Question Id : 630680320261 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the items under **List 1**(collapse load) with those under **List 2** (structure details), based on plastic analysis of structures. Use codes in lists for matching.

[Notations: L - span of beam; M_p – plastic moments]

List 1	List 2
P. $\frac{16M_p}{L}$	1. Simply supported beam with a concentrated load at Centre.
Q. $\frac{8M_p}{L}$	2. Propped Cantilever beam with a concentrated load at centre.
R. $\frac{4M_p}{L}$	3. Fixed beam with a point load at the centre.
S. $\frac{6M_p}{L}$	4. Fixed beam with a uniformly distributed load of intensity w

Options :

1. ✘ P-3, Q-1, R-4, S-2
2. ✔ P-4, Q-3, R-1, S-2
3. ✘ P-4, Q-1, R-2, S-3
4. ✘ P-3, Q-4, R-2, S-1

Question Number : 5 Question Id : 630680320262 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The number of possible plastic hinges are 5 and the degree of indeterminacy of the structure is 2. The number of possible independent mechanisms is :

Options :

1. ✘ 7
2. ✘ 5
3. ✔ 3
4. ✘ 2

Question Number : 6 Question Id : 630680320263 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

For the following Assertion and Reason, which of the following options is correct?

Assertion [A]: The load in the lap joint has eccentricity, therefore a couple is formed which causes undesirable bending in connection.

Reason [R]: To minimise the effect of bending in lap joints at least two bolts in a line should be provided.

Options :

1. ✘ A and R are True but R is not the correct explanation of A.
2. ✔ A and R are True and R is correct explanation of A.
3. ✘ A is True and R is False.
4. ✘ A and R both are False.

Question Number : 7 Question Id : 630680320264 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

As per IS 800 : 2007, when lacings are provided for compression member (say laced steel columns), the lacing shall be designed to carry a transverse shear equal to :

Options :

1. ✔ 2.5 % of axial force in the member
2. ✘ 5 % of axial force in the member
3. ✘ 10 % of axial force in the member
4. ✘ 25 % of axial force in the member

Question Number : 8 Question Id : 630680320265 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The collapse load of a fixed beam of span L with concentrated load W at the mid span is _____, where M_p is the plastic moment.

Options :

1. ✘ $5M_p/64L$
2. ✘ $16M_p/L$

3. ✓ $8M_p/L$ 4. ✗ $3M_p/45L$

Question Number : 9 Question Id : 630680320266 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

A steel rod of 24 mm diameter is used as a tie member in the roof bracing system, and may be subjected to possible reversal of stress due to wind load. What is the maximum permissible length of the member?

Options :

1. ✗ 3000 mm

2. ✓ 2100 mm

3. ✗ 2800 mm

4. ✗ 1800 mm

Question Number : 10 Question Id : 630680320267 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the various proportions of brick ingredients:

Column A	Column B
1.Lime	A] <7 percent
2.Ferric oxide	B] <1 percent
3. Silica	C]10 percent
4. Magnesia	D] 50-60 percent

Options :

1. ✗ 1 - C, 2 - B, 3 - A, 4 - D

2. ✓ 1 - A, 2 - C, 3 - D, 4 - B
3. ✘ 1 - B, 2 - C, 3 - A, 4 - D
4. ✘ 1 - A, 2 - C, 3 - B, 4 - D

Question Number : 11 Question Id : 630680320268 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

_____ is done by a tremie pipe.

Options :

1. ✘ Grouting
2. ✓ Under water concreting
3. ✘ Shotcreting
4. ✘ Guniting

Question Number : 12 Question Id : 630680320269 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The deformation of the shape of bricks caused by _____ is known as chuffs.

Options :

1. ✘ improper heating
2. ✓ rain water falling on hot bricks
3. ✘ over heating
4. ✘ impurities present in raw materials

Question Number : 13 Question Id : 630680320270 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the items under **List 1**(Properties of stone) with those under **List 2** (Test on stones), based on stones used for masonry construction. Use codes in lists for matching.

List 1	List 2
P. Hardness	1. Brard's test
Q. Toughness	2. Acid test
R. Weather resistance	3. Resistance to hammering
S. Frost resistance	4. Mohs scale

Options :

1. ✘ P - 3, Q - 4, R - 1, S - 2
2. ✘ P - 3, Q - 1, R - 4, S - 2
3. ✔ P - 4, Q - 3, R - 2, S - 1
4. ✘ P - 4, Q - 3, R - 1, S - 2

Question Number : 14 Question Id : 630680320271 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Identify the type of defect in timber with the characteristics listed below:

1. Formation of radial splits or cracks wide at circumference and diminishing towards the centre of the tree.
2. Cracks appear as the wood dries below the fibre saturation point.
3. The defect may arise from severe frost and fierce heat of sun.

Options :

1. ✘ Cup shake
2. ✘ Rind gall
3. ✔ Star shake
4. ✘ End split

Question Number : 15 Question Id : 630680320272 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following conclusions 1 and 2 are based on the statement pertaining to the effect of moisture on wood.

Statement :

When the moisture content of wood is above the fiber saturation point, the wood is dimensionally stable.

1. The physical and mechanical properties of wood are independent of moisture content, for moisture content above the fiber saturation point.
2. Shrinkage of wood in the longitudinal direction is the maximum when compared to the radial and tangential directions, for change in the moisture content from the fiber saturation point to oven dry.

Select the correct option based on statement and conclusions.

Options :

1. ✓ Only Conclusion 1 is correct
2. ✗ Only Conclusion 2 is correct
3. ✗ Both conclusions 1 and 2 are correct
4. ✗ None of the conclusions is correct.

Question Number : 16 Question Id : 630680320273 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

According to IS 1786:2008, the yield strength of High strength deformed bars of grade Fe415 or Fe500 is taken as _____ percentage proof stress, in the absence of a definite yield point.

Options :

1. ✗ 0.02
2. ✓ 0.2
3. ✗ 0.5
4. ✗ 1

Question Number : 17 Question Id : 630680320274 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following statements (S1, S2) pertain to the addition of carbon in properties of steel.

S1 : The ductility of steel increases markedly as the carbon content increases.

S2 : The modulus of elasticity is nearly same for tension and compression and is practically independent of the carbon content.

Validate the statements as True/False and choose the correct option.

Options :

1. ✘ Both S1 and S2 are True
2. ✘ S1 is True and S2 is False
3. ✔ S1 is False and S2 is True
4. ✘ Both S1 and S2 are False

Question Number : 18 Question Id : 630680320275 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Under identical conditions for making concrete, select the type of coarse aggregate, which is suitable for making high strength concrete ?

Options :

1. ✘ Rounded aggregates
2. ✘ Flaky aggregates
3. ✘ Irregular aggregates
4. ✔ Angular aggregates

Question Number : 19 Question Id : 630680320276 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Following IS 11215:1991, among the following methods for the determination of moisture content of wood, identify the incorrect method.

Options :

1. ✘ Oven drying method
2. ✘ Electrical moisture meter method
3. ✔ Torsion balance moisture meter method
4. ✘ Distillation method

Question Number : 20 Question Id : 630680320277 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

A reinforced concrete rectangular beam having a width = 240 mm and effective depth = 300 mm is designed as a balanced section, using limit state method. The concrete used is M25 grade and the reinforcing steel is Fe500 grade. The depth of neutral axis of beam from compression side is :

Options :

1. ✘ 159 mm
2. ✘ 150 mm
3. ✘ 144 mm
4. ✔ 138 mm

Question Number : 21 Question Id : 630680320278 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

A simply supported prestressed concrete beam of rectangular cross section of 250 mm wide and gross depth 500 mm is prestressed with a force 750 kN by horizontal cable tendons with a uniform eccentricity of 100 mm. Determine the maximum compressive stress (in N/mm^2 units) in the beam.

Options :

1. ✘ 6
2. ✘ 7.2
3. ✔ 13.2
4. ✘ 12

Question Number : 22 Question Id : 630680320279 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The shorter span of an RCC slab = 2.5 m, what shall be the minimum span (in given options) in a longer direction to consider an RCC slab as two-way?

Options :

1. ✘ 4.8 m
2. ✘ 5.2 m
3. ✔ 3.2 m
4. ✘ 5.5 m

Question Number : 23 Question Id : 630680320280 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following statements (S1, S2) pertain to providing lateral reinforcement in reinforced cement concrete (RCC) columns.

S1 : The purpose of providing lateral ties in a short RCC column is to increase the load carrying capacity of column.

S2 : It is not mandatory to provide lateral reinforcement in RCC columns.

Validate the statements as True/False and choose the correct answer.

Options :

1. ✓ Both S1 and S2 are true.
2. ✗ S1 is true and S2 is false.
3. ✗ S1 is false and S2 is true
4. ✗ Both S1 and S2 are false

Question Number : 24 Question Id : 630680320281 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

As per IS 456 : 2000, for 2 way slabs, with shorter span (less than 3.5 m) and imposed load less than 3 kN/m^2 , the span to overall depth ratio of continuous slabs, with high strength deformed bars of grade Fe415 is :

Options :

1. ✗ 40
2. ✗ 35
3. ✓ 32
4. ✗ 28

Question Number : 25 Question Id : 630680320282 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Identify the correct statement with respect to reinforcement requirement in columns.

Options :

1. ✗ The cross-sectional area of longitudinal reinforcement shall be not less than 0.4 per cent of the gross cross-sectional area of the column.
2. ✗ The minimum number of longitudinal bars provided in a column shall be six rectangular columns.
3. ✗ The maximum diameter of longitudinal reinforcement bars shall not be less than 16 mm.
4. ✓ The spacing of longitudinal bars measured along the periphery of the column shall not exceed 300 mm.

Question Number : 26 Question Id : 630680320283 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Hooks are considered ineffective for which kind of bars for development length purposes?

Options :

1. ✓ Compression
2. ✗ Tension
3. ✗ Torsion
4. ✗ Tension and torsion

Question Number : 27 Question Id : 630680320284 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In order to limit the vertical deflection, according IS 456-2000, the value of span to effective depth ratios for span up to 10m, for continuous reinforced concrete beam is:

Options :

1. ✓ 26
2. ✗ 20
3. ✗ 15
4. ✗ 7

Question Number : 28 Question Id : 630680320285 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

A reinforced concrete beam is subjected to the following bending moments:

Moment due to Dead load = 80 kNm;

Moment due to live load = 120 kNm;

Moment due to Seismic load = 40 kNm.

Following IS 456 : 2000, determine the design bending moment for limit state of collapse.

Options :

1. ✗ 360 kNm
2. ✗ 288 kNm

3. ✓ 300 kNm

4. ✗ 180 kNm

Question Number : 29 Question Id : 630680320286 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the following:

Support /Structure	Degrees of freedom
1.Paricle in space	A] 2
2.Hinged support	B] 3
3. Roller Support	C] 0
4.Fixed Support	D] 1

Options :

1. ✗ 1 - D, 2 - B, 3 - A, 4 - C

2. ✗ 1 - C, 2 - D, 3 - A, 4 - B

3. ✓ 1 - B, 2 - D, 3 - A, 4 - C

4. ✗ 1 - C, 2 - D, 3 - B, 4 - A

Question Number : 30 Question Id : 630680320287 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

A specimen has a modulus of elasticity of 150GPa and a modulus of rigidity of 50GPa. The Poisson's ratio of the material is:

Options :

1. ✓ $\frac{1}{2}$

2. ✗ 2

3. ✗ $\frac{1}{3}$

4. ✗ 3

Question Number : 31 Question Id : 630680320288 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Determine the deflection at the centre of a simply supported beam of span 4 m (with pin jointed supports at the two ends) with two equal unlike couples of 20 kNm at the two ends. (take flexural rigidity EI as constant for the beam).

Options :

1. ✗ $\frac{50}{EI}$

2. ✗ $\frac{20}{EI}$

3. ✓ $\frac{40}{EI}$

4. ✗ $\frac{80}{EI}$

Question Number : 32 Question Id : 630680320289 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time :

N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Identify the method which does not belong to the compatibility method for the analysis of statically indeterminate structures.

Options :

1. ✘ Method of consistent deformations
2. ✔ Slope deflection method
3. ✘ Column analogy method
4. ✘ Theorem of three moments

Question Number : 33 Question Id : 630680320290 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

A cantilever beam AB (fixed end is A and free end is B) of span 8 m carries a uniformly distributed load of 25 kN/m for the entire span. The virtual work equation to determine the deflection at the free end Δ_B is expressed as : (Note : distance x is measured from the free end B). Assume EI as constant for the beam.

Options :

1. ✔ $\Delta_B = \frac{12.5}{EI} \int_0^8 x^3 dx$

2. ✘ $\Delta_B = \frac{2.5}{EI} \int_0^8 x^3 dx$

3. ✘ $\Delta_B = \frac{8}{EI} \int_0^8 x^3 dx$

4. ✘ $\Delta_B = \frac{12.5}{EI} \int_0^8 x^2 dx$

Question Number : 34 Question Id : 630680320291 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The various possible types of mechanism formation in the plastic analysis of steel structures are given as options. Identify the Incorrect one.

Options :

1. ✘ Beam mechanism
2. ✘ Sway mechanism
3. ✘ Gable mechanism
4. ✔ Load mechanism

Question Number : 35 Question Id : 630680320292 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

For the following Assertion and Reason, which of the following options is correct?

Assertion [A]: A structure whose reaction components cannot be determined by using static equations of equilibrium is called as Statically indeterminate structures.

Reason [R]: The additional equations to solve statically indeterminate structures are taken from conditions of rotations, translations called as conditions of compatibility.

Options :

1. ✘ A is True and R is False.
2. ✘ A and R both are False.
3. ✔ A and R are True but R is the correct explanation of A.
4. ✘ A and R are True and R is not the correct explanation of A.

Question Number : 36 Question Id : 630680320293 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Select the correct option based on the meaning of the Statement.

Statement:

A simply supported beam carrying a point load at the midspan is analysed used strain energy method to calculate the deflection and strain energy.

Conclusion:

[i] The deflection is calculated as $P^3L^3/96EI$.

[ii] The strain energy is calculated as $PL^3/48EI$.

Options :

1. ✘ Only conclusion [i] is correct.
2. ✘ Only conclusion [ii] is correct.
3. ✘ Both conclusions [i] and [ii] are correct.
4. ✔ Neither conclusion [i] nor [ii] are correct.

Question Number : 37 Question Id : 630680320294 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

If a plane truss contains m members and j joints, then the truss is said to be internally stable if:

Options :

1. ✘ $m > 2j - 3$
2. ✔ $m < 2j - 3$
3. ✘ $m > 3j - 2$
4. ✘ $m < 3j - 2$

Question Number : 38 Question Id : 630680320295 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Castigliano's theorem of minimum strain energy used for the analysis of statically indeterminate structures, falls under the category of :

Options :

1. ✘ Equilibrium method
2. ✔ Compatibility method
3. ✘ Stiffness method
4. ✘ Displacement method

Question Number : 39 Question Id : 630680320296 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The average duration of a particle of water to pass through a place of the hydrological cycle is known as _____ of that phase.

Options :

1. ✘ evaporating time
2. ✔ residence time
3. ✘ passing time
4. ✘ precipitating time

Question Number : 40 Question Id : 630680320297 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Among the following types of dams given as options, identify the dam which can be constructed both as an overflow dam and non-overflow dam.

Options :

1. ✘ Earth dam
2. ✘ Arch dam
3. ✔ Gravity dam
4. ✘ Rockfill dam

Question Number : 41 Question Id : 630680320298 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following statements (S1 to S4) pertain to the lining of canals.

S1 : The cross-section area of lined canal is less than that for an unlined canal, for the same discharge.

S2 : Lining of canals provides a rough surface, and thereby increases the rugosity co-efficient.

S3 : Lined canals have greater evaporation loss than unlined canals.

S4 : Lined canals have flatter hydraulic gradient than unlined canals, for carrying the same discharge.

Which of the statement(s) is/are correct ?

Options :

1. ✘ S1, S2, S3 only
2. ✘ S3 only
3. ✘ S2, S3 only
4. ✔ S1, S4 only

Question Number : 42 Question Id : 630680320299 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In the case of a diversion weir constructed in a river, with, having a horizontal impervious floor of length b with a cutoff of depth d at the downstream end of floor, the permissible value of exit gradient G_E , following Khosla's

theory is given by : (take H – height of water stored on the upstream of weir ; $\lambda = \frac{1}{2} \left[1 + \sqrt{1 + \left(\frac{b}{d}\right)^2} \right]$)

Options :

1. ✘ $G_E = \left(\frac{d}{H}\right) \left(\frac{1}{\pi\sqrt{\lambda}}\right)$

2. ✘ $G_E = \left(\frac{H}{d}\right) \left(\frac{1}{\pi\lambda}\right)$

3. ✔ $G_E = \left(\frac{H}{d}\right) \left(\frac{1}{\pi\sqrt{\lambda}}\right)$

4. ✘ $G_E = \left(\frac{H}{d}\right) \left(\frac{\pi}{\sqrt{\lambda}}\right)$

Question Number : 43 Question Id : 630680320300 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

It is proposed to design a barrage across a river in alluvial soil. The piezometric head at the bottom of the impervious floor is computed as 9.5 m. The datum is 3.5 m below the floor bottom. The assured standing water depth above the floor is 1 m. The specific gravity of floor material is 2.5. The required minimum thickness of the impervious floor is :

Options :

1. ✘ 3.3 m

2. ✘ 1.8 m
 3. ✘ 2.5 m
 4. ✔ 2 m

Question Number : 44 Question Id : 630680320301 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The base width of an elementary profile of a gravity dam of height H is B. If G is the specific gravity of the material and C co-efficient of uplift, the relationship for no tension development at the heel of dam is :

Options :

1. ✔ $B = \frac{H}{\sqrt{G - C}}$

2. ✘ $B = \frac{H}{(G - C)}$

3. ✘ $B = H \sqrt{G - C}$

4. ✘ $B = \frac{H}{C \sqrt{G - C}}$

Question Number : 45 Question Id : 630680320302 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the items under List 1 (Irrigation efficiencies) with those under List 2 (Estimation of Irrigation efficiencies). Use codes in the list for matching the items.

List 1	List 2
P. Water conveyance efficiency	1. Ratio of quantity of water stored in the root zone of crops to quantity of water delivered to field.
Q. Consumptive use efficiency	2. Ratio of normal consumptive use of water to net amount of water depleted from root zone of soil
R. Water application efficiency	3. Ratio of water stored in root zone during irrigation to water needed in root zone prior to irrigation
S. Water storage efficiency	4. Ratio of water delivered to farm to water diverted from the reservoir.

Options :

1. ✘ P - 4, Q - 3, R - 2, S - 1
2. ✘ P - 2, Q - 3, R - 4, S - 1
3. ✘ P - 3, Q - 1, R - 4, S - 2
4. ✔ P - 4, Q - 2, R - 1, S - 3

Question Number : 46 Question Id : 630680320303 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following conclusions 1 and 2 are based on the statement pertaining to criteria for design of solid gravity dams.

Statement :

According to IS 6512 -1984, the design of gravity dam has to be done for the adverse load combinations, of which two are given.

1. Load combination A (Construction condition) : Full reservoir elevation, normal dry weather tail water, normal uplift, ice/silt (if applicable).
2. Load combination C (Flood discharge condition) : Reservoir at maximum flood pool elevation, all gates open, tailwater at flood elevation, normal uplift and silt pressure(if applicable).

Select the correct option based on statement and conclusions.

Options :

1. ✘ Only conclusion 1 is correct

2. ✓ Only conclusion 2 is correct
3. ✗ Both conclusions 1 and 2 are correct
4. ✗ None of the conclusions is correct.

Question Number : 47 Question Id : 630680320304 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In connection with the design of a barrage in an alluvial stream, identify the correct matching of List 1 (Components of design) with those in List 2 (Criteria used for design). Use codes in list for matching.

List 1	List 2
P. Width of waterway for the barrage	1. Lacey's scour depth and exit hydraulic gradient as given by Khosla's theory
Q. Total length of floor and depth of downstream cut-off	2. Hydraulic Jump considerations
R. Level and length of downstream floor	3. Uplift pressure distribution determined by Khosla's theory
S. Thickness of Barrage floor at different locations	4. Lacey's wetted perimeter and discharge capacity of barrage determined by weir formula

Options :

1. ✓ P - 4, Q - 1, R - 2, S - 3
2. ✗ P - 2, Q - 3, R - 4, S - 1
3. ✗ P - 4, Q - 3, R - 1, S - 2
4. ✗ P - 3, Q - 4, R - 1, S - 2

Question Number : 48 Question Id : 630680320305 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The details pertaining to a distributary canal for the irrigation interval are as follows : Consumptive use of a crop = 8 cm ; irrigation interval = 12 days; effective rainfall = 2 cm ; water application efficiency = 75 % ; conveyance efficiency of canal = 50 % . Determine the Gross irrigation

requirement of distributary. Ignore the water loss due to deep percolation.

Options :

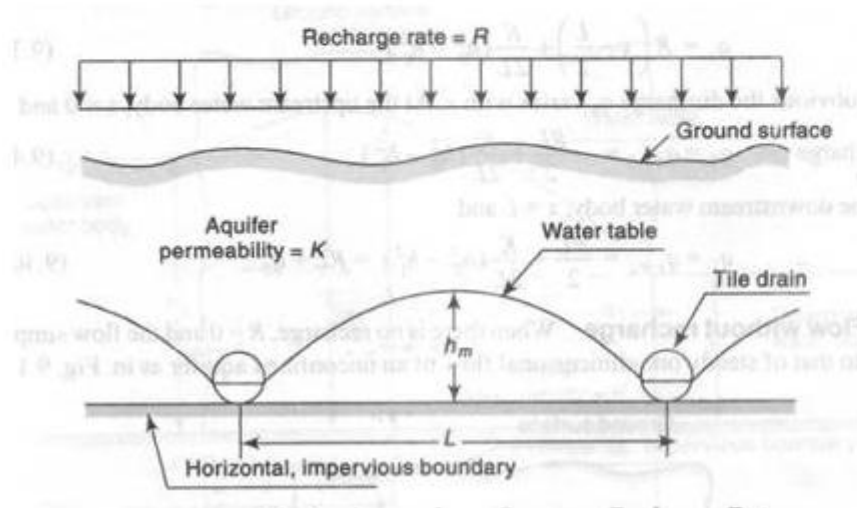
1. ✓ 16 cm
2. ✗ 8 cm
3. ✗ 12 cm
4. ✗ 20 cm

Question Number : 49 Question Id : 630680320306 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The figure shows tile drainages provided for sub surface drainage for a water-logged area under steady state conditions. Neglecting the depth of water in the drains, an approximate relationship for the water table profile is given by :

(Notations : L – spacing between the drains ; k – co-efficient of permeability of the soil, h – height of water table from the drain bottom, at a horizontal distance x from the drain; R – recharge rate by irrigation or rainfall)



Options :

1. ✗ $h^2 = \frac{R}{k} (L - x)x^2$

2. ✘ $h = \frac{R}{k}(L - x)x$

3. ✔ $h^2 = \frac{R}{k}(L - x)x$

4. ✘ $h^2 = \frac{R}{k}(L - x)^2x$

Question Number : 50 Question Id : 630680320307 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

For the following Assertion and Reason, which of the following options is correct?

Assertion [A]: The detailed estimate includes the determination of the quantities and costs of everything that is required to complete the project.

Reason [R]: To perform this type of estimate, the contractor must have a complete set of contract documents. Each item of the project should be broken down into its parts and estimated.

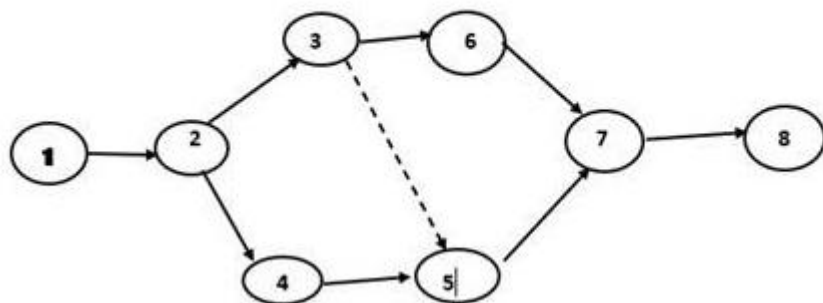
Options :

1. ✘ A is True and R is False.
2. ✘ A and R both are False.
3. ✔ A and R are True and R is the correct explanation of A.
4. ✘ A and R are True and R is not the correct explanation of A.

Question Number : 51 Question Id : 630680320308 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In the network shown for a project in Figure, identify the concurrent activities:



Options :

1. ✘ Activity 3 - 6 and 4 - 5
2. ✘ Activity 1 - 2 and 2 - 4
3. ✔ Activity 2 - 3 and 2 - 4
4. ✘ Activity 1 - 2 and 7 - 8

Question Number : 52 Question Id : 630680320309 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

It is decided to have a bridge constructed across a river. Among the statements (S1, S2, S3, S4) given identify the statement(s) that is/are associated with detailed cost estimate.

S1 : An estimate is made for each of the potential alternatives, like tied arch bridge, or cantilever truss bridge.

S2 : Estimate is prepared on the basis of the layout of the selected bridge type based on preliminary conceptual design.

S3 : Estimate prepared on the basis of detailed design with all essential details known.

S4 : These estimates are associated with detailed plans and specifications for all items of the work.

Options :

1. ✘ S1 only
2. ✘ S1 and S2 only
3. ✘ S3 only
4. ✔ S3 and S4 only

Question Number : 53 Question Id : 630680320310 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following statements (S1, S2) pertain to cost control in construction projects.

S1 : Cost control in a project is mainly associated with the construction stage and can be achieved on labour, plants and equipments.

S2 : Cost control is independent on the design and specifications for the works involved in the project.

Validate the statements as True/False and choose the correct option

Options :

1. ✘ Both S1 and S2 are True.
2. ✔ S1 is True and S2 is False
3. ✘ S1 is False and S2 is True
4. ✘ Both S1 and S2 are False

Question Number : 54 Question Id : 630680320311 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Select the correct option based on the meaning of the Statement.

Statement:

The combination of direct and indirect project costs give a curvilinear relationship with time

Conclusions:

1. The total cost of the project will be minimum at a point corresponding to optimum duration.
2. If the project duration is increased beyond the optimum duration for the project, the total project cost decreases.

Options :

1. ✔ Only conclusion 1 is correct
2. ✘ Only conclusion 2 is correct
3. ✘ Both conclusions 1 and 2 are correct
4. ✘ None of the conclusions are correct

Question Number : 55 Question Id : 630680320312 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Select the correct option based on the meaning of the Statement.

Statement:

A bar chart displays the construction project's various activities in a graphical format, with their respective duration represented by bars.

Conclusions:

1. A bar chart refer to a chart that displays duration of various activities in a project.
2. The time generally refers to the graphical representation of activities occurring over a specific time.

Options :

1. ✖ Only conclusion 1 is correct
2. ✖ Only conclusion 2 is correct
3. ✔ Both conclusions 1 and 2 are correct
4. ✖ None of the conclusions are correct.

Question Number : 56 Question Id : 630680320313 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The total float for various activities in a network for a project is given in Table. The most critical activity is :

Activity	1- 2	2-3	3-4	4-5
Total float	3	5	6	4

Options :

1. ✔ 1 - 2
2. ✖ 2 - 3
3. ✖ 3 - 4
4. ✖ 4 - 5

Question Number : 57 Question Id : 630680320314 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Select the correct option based on the meaning of the Statement.

Statement:

PERT analysis is a management tool used for planning, controlling, and reviewing a project.

Conclusion:

1. The critical path in PERT represents the shortest path in a project network.
2. Activities on the critical path have zero slack time.

Options :

1. ✘ Only conclusion 1 is correct
2. ✔ Only conclusion 2 is correct
3. ✘ Both conclusions 1 and 2 are correct
4. ✘ None of the conclusions are correct

Question Number : 58 Question Id : 630680320315 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The flow in the open channel is said to be laminar if the Reynold number is:

Options :

1. ✔ less than 500
2. ✘ more than 1200
3. ✘ between 500 and 800
4. ✘ between 800 and 1200

Question Number : 59 Question Id : 630680320316 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

For a channel having bed slope S_0 the differential equation for gradually varied flow can be expressed in terms of section factor of flow Z and conveyance of channel K for the depth of flow y as : (Notations : Z_c – section factor of channel corresponding to critical flow depth; K_n – conveyance of the channel corresponding to the normal depth y_n of flow)

Options :

1. ✘
$$\frac{dy}{dx} = S_0 \frac{1 - (K_n/K)^3}{1 - (Z_c/Z)^3}$$

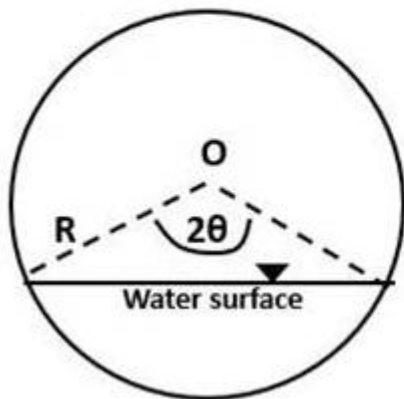
2. ✘
$$\frac{dy}{dx} = S_0 \frac{1 - (Z_c/Z)^2}{1 - (K_n/K)^2}$$

3. ✔
$$\frac{dy}{dx} = S_0 \frac{1 - (K_n/K)^2}{1 - (Z_c/Z)^2}$$

4. ✘
$$\frac{dy}{dx} = S_0 \frac{1 - (K/K_n)^2}{1 - (Z/Z_c)^2}$$

Question Number : 60 Question Id : 630680320317 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Correct Marks : 1 Wrong Marks : 0.33

A circular drainage channel of radius R , carries water flow as in figure, subtending an angle 2θ at the centre. The hydraulic radius(HR) of the flow through the circular channel is expressed as :



Options :

1. ✓ $HR = \frac{R \left(\theta - \frac{\sin 2\theta}{2} \right)}{2\theta}$

2. ✗ $HR = \frac{R \left(\theta - \frac{\cos 2\theta}{2} \right)}{2\theta}$

3. ✗ $HR = \frac{R \left(\theta - \frac{\sin \theta}{2} \right)}{\theta}$

4. ✗ $HR = \frac{R^2 \left(2\theta - \frac{\sin 2\theta}{2} \right)}{2\theta}$

Question Number : 61 Question Id : 630680320318 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the velocity distribution in open channel flow, and the following assertion and reason statements, which of the options is correct?

Assertion (A) :

In an open channel flow, the maximum velocity does not occur on the free surface.

Reason (R) :

The surface wind has a pronounced effect on the vertical velocity distribution in channels.

Options :

1. ✖ Both A and R are true, and R is the correct explanation of A.
2. ✖ Both A and R are true, but R is not the correct explanation of A.
3. ✔ A is true, but R is false.
4. ✖ Both A and R are false.

Question Number : 62 Question Id : 630680320319 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In an open channel flow, if S_0 is the bed slope of channel, S_w the free water surface slope and S_e the slope of the total energy line. If uniform flow occurs in the channel, the valid condition is : (Symbols used ; < indicate less than ; = indicate equal to ; > indicates greater than)

Options :

1. ✖ $S_0 = S_w < S_e$
2. ✔ $S_0 = S_w = S_e$
3. ✖ $S_0 < S_w < S_e$
4. ✖ $S_0 > S_w = S_e$

Question Number : 63 Question Id : 630680320320 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The flow in open channel is said to be sub critical if Froud's number is:

Options :

1. ✖ equal to 1
2. ✔ less than 1
3. ✖ more than 1

4. ✘ equal to 0

Question Number : 64 Question Id : 630680320321 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the items under List 1 (Type of Gradually varied flow profile) with those under List 2 (Range of values for flow depth for the gradually varied flow profile). Use codes in the list for matching the items.

(Notations: y_n – Normal depth of flow ; y_c – critical depth of flow ; y – depth in gradually varied flow)

List 1	List 2
P. S_1 profile	1. $y > y_n > y_c$
Q. S_3 Profile	2. $y_n > y > y_c$
R. M_1 Profile	3. $y > y_c > y_n$
S. M_2 profile	4. $y_c > y_n > y$

Options :

1. ✘ P – 4, Q – 1, R – 2, S – 1
2. ✘ P – 2, Q – 3, R – 1, S – 4
3. ✘ P – 1, Q – 3, R – 4, S – 2
4. ✔ P – 3, Q – 4, R – 1, S – 2

Question Number : 65 Question Id : 630680320322 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The hydraulic radius for the most economical cross section of a rectangular open channel is 1 m. The cross sectional area of the channel in m^2 units is :

Options :

1. ✘ 12
2. ✘ 4

3. ✘ 6

4. ✔ 8

Question Number : 66 Question Id : 630680320323 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

A stationary hydraulic jump occurs in a rectangular open channel when the depth of flow is 0.3 m. If the initial Froude number of the jump is $\sqrt{10}$, determine the sequent depth after the jump.

Options :

1. ✘ 2.4 m

2. ✔ 1.2 m

3. ✘ 1.6 m

4. ✘ 2.8 m

Question Number : 67 Question Id : 630680320324 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In connection with the analysis of hydraulic jump in a horizontal rectangular open channel, the statements (S1 and S2) are given.

S1 : Specific energy before the jump and after the jump are equal.

S2 : Specific force before the jump is equal to Specific force after the jump.

Validate the statements as True /False and choose the correct option.

Options :

1. ✘ Both S1 and S2 are True.

2. ✘ S1 is True and S2 is False
3. ✔ S1 is False and S2 is True.
4. ✘ Both S1 and S2 are False.

Question Number : 68 Question Id : 630680320325 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Among the Gradually Varied Flow profiles in an open channel flow given as options, identify the one in which the flow is super critical in nature.

Options :

1. ✘ M_1
2. ✘ M_2
3. ✘ S_1
4. ✔ S_3

Question Number : 69 Question Id : 630680320326 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Among the following Gradually Varied Flow profiles in an open channel, identify the drawdown curve type.

Flow profiles : M_1, M_2, S_2, S_3, H_3 .

Options :

1. ✘ H_3 only
2. ✘ M_1 and H_3 only
3. ✔ H_2 and S_2 only
4. ✘ M_2 , S_3 and H_3 only

Question Number : 70 Question Id : 630680320327 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following conclusions 1 and 2 are based on the statement pertaining to critical state of flow in open channels.

Statement : For a given discharge, the specific energy is a minimum at critical flow.

1. Velocity head is equal to one half of the hydraulic depth.
2. Froude number for the flow is unity.

Select the correct option based on statement and conclusions.

Options :

1. ✘ Only Conclusion 1 is correct.
2. ✘ Only conclusion 2 is correct.
3. ✔ Both conclusions 1 and 2 are correct
4. ✘ None of the conclusions is correct.

Question Number : 71 Question Id : 630680320328 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

For a wide rectangular open channel of bottom width B and having normal depth of flow y_n , following the Manning's equation, the conveyance K of the channel is estimated as : (n - manning's co-efficient of roughness)

Options :

1. ✘ $K = \frac{B \cdot y_n^{2/3}}{n}$

2. ✔ $K = \frac{B \cdot y_n^{5/3}}{n}$

3. ✘ $K = \frac{B \cdot y_n^{3/5}}{n}$

4. ✘ $K = \frac{B \cdot y_n^{8/3}}{n}$

Question Number : 72 Question Id : 630680320329 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

What is the effective length (L) of the compression flange if the end condition of the beam is unrestrained against torsion and unrestrained against lateral bending in simply supported beams?

Options :

1. ✘ $0.7L$

2. ✘ 0.85L

3. ✔ L

4. ✘ 3L

Question Number : 73 Question Id : 630680320330 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the following.

Column A	Column B
1. Blowing agent	A] To make the moulding of plastic easier
2. Pigment	B] To accelerate the polymerisation
3. Catalyst	C] To produce porous articles
4. Lubricant	D] To achieve desired colour of the plastic

Options :

1. ✔ 1 - C, 2 - D, 3 - B, 4 - A

2. ✘ 1 - C, 2 - B, 3 - D, 4 - A

3. ✘ 1 - B, 2 - D, 3 - A, 4 - C

4. ✘ 1 - A, 2 - C, 3 - B, 4 - D

Question Number : 74 Question Id : 630680320331 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

For the following Assertion and Reason, which of the following options is correct?

Assertion [A]: The Frames in which lateral translations are prevented are analysed as continuous beams.

Reason [R]: The lateral sway is prevented by support conditions or due to symmetrical loading and symmetry of the frame.

Options :

1. ✘ A is True and R is False.
2. ✘ A and R both are False.
3. ✔ A and R are True but R is the correct explanation of A.
4. ✘ A and R are True and R is not the correct explanation of A.

Question Number : 75 Question Id : 630680320332 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Select the correct option based on the meaning of the Statement.

Statement: Carryover moment is defined as the moment induced at the fixed end of the beam by the action of moment applied at the other end that is hinged.

Conclusion:

[i] Carryover moment is opposite in nature of the applied moment.

[ii] It is half the applied moment.

Options :

1. ✘ Only conclusion [i] is correct.
2. ✔ Only conclusion [ii] is correct.
3. ✘ Both conclusions [i] and [ii] are correct.
4. ✘ Neither conclusion [i] nor [ii] are correct.

Question Number : 76 Question Id : 630680320333 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the following as part of project planning.

	List 1		List 2
1	Total float	A	The amount of time by which an activity can be delayed without affecting the EST of the succeeding activity.
2	Free float	B	Difference between total float and free float.
3	Interfering float	C	The difference between the maximum time available and the actual time required for the completion of the activity.

Options :

1. ✘ 1 - A, 2 - B, 3 - C
2. ✘ 1 - C, 2 - B, 3 - A
3. ✘ 1 - B, 2 - C, 3 - A
4. ✔ 1 - C, 2 - A, 3 - B

Question Number : 77 Question Id : 630680320334 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the following as part of project planning.

	List 1		List 2
1	Activity	A	It is an instant of time or state at which some specific milestone has been achieved.
2	EVENT	B	This is the time by which an event may be delayed without affecting the completion time of the project.
3	Slack	C	When the project is broken down into various operations, operations consume time or resources.

Options :

1. ✘ 1 - a, 2 - b, 3 - c
2. ✘ 1 - c, 2 - b, 3 - a
3. ✘ 1 - b, 2 - c, 3 - a
4. ✔ 1 - c, 2 - a, 3 - b

Question Number : 78 Question Id : 630680320335 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

For a catchment area of 72 km^2 , a triangular direct runoff hydrograph due to an isolated storm has a time base of 40 hours and a peak flow $50 \text{ m}^3/\text{s}$ occurring at 20 hours from the start. Determine the rainfall excess for the storm.

Options :

1. ✘ 10 cm
2. ✔ 5 cm
3. ✘ 7.5 cm
4. ✘ 8 cm

Question Number : 79 Question Id : 630680320336 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following conclusions (1 and 2) are derived on the basis of a precipitation values from the mass curve of rainfall of a self-recording rain gauge given in the table.

Time from start of rainfall (minutes)	0	20	40	60	80	100
Cumulative rainfall (mm)	0	5	12	12	25	35

Conclusions:

1. The intensity of rainfall during the time interval (0 to 20) is more than the intensity of rainfall during the time interval (40 to 60).
2. The intensity of rainfall during the time interval (20 to 40) is more than the intensity of rainfall during the time interval (80 to 100).

Select the correct option based on conclusions.

Options :

1. ✓ Only conclusion 1 is correct
2. ✗ Only conclusion 2 is correct
3. ✗ Both conclusions 1 and 2 are correct
4. ✗ Neither conclusion 1 nor 2 is correct

Question Number : 80 Question Id : 630680320337 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Which of the following is NOT an analytical method for the estimation of lake evaporation ?

Options :

1. ✗ Water budget method
2. ✗ Energy balance method
3. ✗ Mass transfer method
4. ✓ Evaporimeter method

Question Number : 81 Question Id : 630680320338 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the evapotranspiration from a vegetative field and the following assertion (A) and reason (R) statements, which of the options is/are correct?

Assertion (A) : When the soil moisture is maintained at field capacity of soil, the actual evapotranspiration is equal to potential evapotranspiration.

Reason (R) : Potential evapotranspiration of a crop is calculated by dividing the reference crop evapotranspiration by the crop co-efficient.

Options :

1. ✖ Both A and R are true and R is the correct explanation of A
2. ✖ Both A and R are true, but R is not the correct explanation of A
3. ✔ A is true, but R is false
4. ✖ Both A and R are false

Question Number : 82 Question Id : 630680320339 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following statements (S1, S2) pertain to transpiration from a vegetative field.

S1 : Transpiration can be determined by using Lysimeters.

S2 : Transpiration is essentially confined to daylight hours only.

Validate the statements as true or false and select the most appropriate option.

Options :

1. ✖ Both S1 and S2 are true
2. ✖ S1 is true, but S2 is false
3. ✔ S1 is false, but S2 is true
4. ✖ Both S1 and S2 are false

Question Number : 83 Question Id : 630680320340 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Analysis of annual flood series of a river yielded a sample mean of $5000 \text{ m}^3/\text{s}$ and standard deviation of 2000. Estimate the design flood for a bridge to be constructed across the river for a return period of 500 years. Take the frequency factor for the flood data, for return period of 500

years as 4.

Options :

1. ✘ 22000 cumecs
2. ✔ 13000 cumecs
3. ✘ 9000 cumecs
4. ✘ 14000 cumecs

Question Number : 84 Question Id : 630680320341 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Read the following statement and conclusions pertaining to soil strata at two aquifers with respect to ground water and select the most appropriate option.

Statement: Two types of soil strata having high porosity values (40 to 48 %) are seen at two locations L1 and L2 as, L1 : Clay strata, and L2 : Sandy strata.

Conclusions:

- 1 : The specific yield values at L1 is more than that at L2, and hence more ground water can be extracted from L1 compared to L2.
- 2: The specific retention values at L1 is lesser when compared to L2.

Options :

1. ✘ Only conclusion 1 is correct
2. ✘ Only conclusion 2 is correct
3. ✘ Both conclusions 1 and 2 are correct
4. ✔ Neither conclusion 1 nor 2 is correct

Question Number : 85 Question Id : 630680320342 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

A 30 cm diameter well completely penetrates a confined aquifer of permeability 45 m/day. The length of the strainer is 20 m. Under steady state of pumping of 1550 litre/minute, the drawdown at the well was found to be 3 m and the radius of influence is 300 m. If the drawdown in the well is increased to 4.5 m, and all other data remain unchanged, estimate the discharge (in litre/minute) from the well.

Options :

1. ✘ 1550.0
2. ✔ 2325.0

3. ✘ 1033.3

4. ✘ 3487.5

Question Number : 86 Question Id : 630680320343 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the hydrograph analysis, and the following assertion (A) and reason (R) statements, which of the options is correct?

Assertion (A): The D-hour unit hydrograph of a catchment may be obtained by dividing the ordinates of a single peak direct runoff hydrograph due to a storm of D-hour duration, by the direct runoff volume (in cm units).

Reason (R): The direct runoff response to the rainfall excess is assumed to be linear in unit hydrograph theory.

Options :

1. ✔ Both A and R are true, and R is the correct explanation of A
2. ✘ Both A and R are true, but R is not the correct explanation of A
3. ✘ A is true, but R is false
4. ✘ Both A and R are false

Question Number : 87 Question Id : 630680320344 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the following items under List 1 (Field of hydrology) with those under List 2 (Name of theory/method).

List 1	List 2
P. Evaporation	1. Dupit's theory
Q. Unit hydrograph	2. Penman-monteith method
R. Steady flow to wells in unconfined aquifers	3. Sherman theory
S. Reference crop evapotranspiration	4. Dalton's method

Options :

1. ✘ P – 3, Q – 4, R – 2, S – 1
2. ✘ P – 2, Q – 4, R – 1, S – 3
3. ✘ P – 4, Q – 1, R – 2, S – 3

4. ✓ P – 4, Q – 3, R – 1, S – 2

Question Number : 88 Question Id : 630680320345 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The indicator organism used to determine the contamination of drinking water is:

Options :

1. ✗ iron bacteria
2. ✓ coliform bacteria
3. ✗ giardia
4. ✗ salmonella

Question Number : 89 Question Id : 630680320346 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Following the drinking water standards IS 10500:2012, the permissible limit of Nitrates (as NO_3) in mg/l units, in drinking water in the absence of alternate source is:

Options :

1. ✗ 200
2. ✗ 100
3. ✓ 45
4. ✗ 15

Question Number : 90 Question Id : 630680320347 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Which of the following characteristics does NOT come under the classification of organoleptic and physical parameters specified in drinking water-specification of IS 10500 : 2012?

Options :

1. ✗ pH value
2. ✗ Turbidity
3. ✗ Total dissolved solids

4. ✓ E-coli

Question Number : 91 Question Id : 630680320348 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Which of the following is NOT a method of removal of excess fluorine if present in public water supplies?

Options :

1. ✗ Use of anion exchange resins
2. ✓ Facilitate oxidation using contact beds
3. ✗ Adsorption by magnesium hydroxide
4. ✗ Using activated carbon

Question Number : 92 Question Id : 630680320349 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Identify the type of rotary valve used in water supply distribution lines with the following features.

1. The valve has a large movable disk so as to completely fit in the inside of the pipe.
2. The disk rotates on a spindle or shaft in only one direction to either closed or open position.

Options :

1. ✗ Plug valve
2. ✓ Butterfly valve
3. ✗ Ball valve
4. ✗ Altitude valve

Question Number : 93 Question Id : 630680320350 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the disinfection process in water treatment and the following assertion (A) and reason (R) statements, which of the options is correct?

Assertion (A): Free chlorine is one of the most commonly used disinfectants for removal of pathogens in treatment of water.

Reason (R): When chlorine is added to water a mixture of hypochlorous acid (HOCl) and hydrochloric acid is formed, and the reaction depends

on the pH of water.

Options :

1. ✓ Both A and R are true and R is the correct explanation of A
2. ✗ Both A and R are true, but R is not the correct explanation of A
3. ✗ A is true, but R is false
4. ✗ Both A and R are false

Question Number : 94 Question Id : 630680320351 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the items under List 1 (Filtration mechanisms) with those under List 2 (Illustration of mechanisms).

List 1	List 2
P. Sedimentation	1. Particles (with diameter less than 1 micron) move randomly about within the fluid, due to thermal gradients.
Q. Interception	2. Larger particles move fast enough to travel off their streamlines and bump into media grains.
R. Brownian diffusion	3. Due to force of gravity and the associate settling velocity of the particle, which causes it to cross the streamlines and reach the collector.
S. Inertia	4. Large enough particle follows the streamline that lies very close to the media surface, hits the media grain and be captured.

Options :

1. ✗ P – 2, Q – 4, R – 1, S – 3
2. ✓ P – 3, Q – 4, R – 1, S – 2
3. ✗ P – 4, Q – 1, R – 2, S – 3
4. ✗ P – 3, Q – 1, R – 4, S – 2

Question Number : 95 Question Id : 630680320352 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

As per IS : 4111(Part1) – 1986, when a sewer connects with another sewer, where the difference in level between water lines (peak flow levels) of main line and the invert level of branch line is more than 600 mm, the type of manhole recommended for the site is:

Options :

1. ✘ scraper manhole
2. ✘ straight through manhole
3. ✔ drop manhole
4. ✘ junction manhole

Question Number : 96 Question Id : 630680320353 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Study the following statement and conclusions pertaining to design of gravity sewers and select the most appropriate option.

Statement:

A sewer M is to be designed to generate equivalent self-cleansing action as in sewer N.

Conclusions:

1. The slope of sewer M must be equal to slope of sewer N.
2. Tractive force intensity generated in sewer M must be the same as that in sewer N.

Options :

1. ✘ Only conclusion 1 is correct
2. ✔ Only conclusion 2 is correct
3. ✘ Both conclusions 1 and 2 are correct
4. ✘ Neither conclusion 1 nor 2 is correct.

Question Number : 97 Question Id : 630680320354 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

According to SP : 35 (S&T) – 1987, steel pipes are recommended for pressure sewer mains of diameter above 750 mm. Identify the INCORRECT option related to the characteristic of steel pipes.

Options :

1. ✘ Pipes are susceptible to various types of corrosion
2. ✘ They are more ductile and withstand water hammer better
3. ✘ Likely to collapse when it is subjected to negative pressure
4. ✔ Ability to withstand high external load

Question Number : 98 Question Id : 630680320355 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Two sewer pipes P and Q (having same length, diameter, friction factor, material) are used in a gravity sewer drainage system. The slope of sewer P is 1 in 125 and that of Q is 1 in 500. The ratio of velocity of flow in sewers P and Q (V_P/V_Q) is:

Options :

1. ✓ 2
2. ✗ 0.5
3. ✗ 4
4. ✗ 0.25

Question Number : 99 Question Id : 630680320356 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

As per the Ministry of Environment, Forest and Climate Change notification, October 2017, the Bio-chemical Oxygen Demand (BOD) concentration (in mg/l units) of effluents, for all modes of disposal from sewage treatment plants (STPs) in metro cities of India shall NOT exceed:

Options :

1. ✗ 35
2. ✓ 30
3. ✗ 20
4. ✗ 10

Question Number : 100 Question Id : 630680320357 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Among the different methods used for waste water treatment, identify the one that does NOT belong to the category of secondary treatment.

Options :

1. ✗ Precipitation
2. ✗ Adsorption
3. ✓ Sedimentation

4. ✘ Biological treatment for nitrogen removal

Question Number : 101 Question Id : 630680320358 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the items under List 1 (Sewage treatment unit) with those under List 2 (Major component to be removed).

List 1	List 2
P. Square Grit chamber	1. Dissolved organic matter
Q. Screens	2. Suspended Inorganic matter
R. Trickling filter	3. Suspended organic matter
S. Primary settling tanks	4. Large floating matter

Options :

1. ✘ P – 4, Q – 1, R – 2, S – 3
2. ✘ P – 3, Q – 4, R – 2, S – 1
3. ✘ P – 2, Q – 3, R – 4, S – 1
4. ✔ P – 2, Q – 4, R – 1, S – 3

Question Number : 102 Question Id : 630680320359 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In a water authority for a locality, the following quantities are known. Accounted water supplied from the water works (WS), Unaccounted private water supplies (PS), Ground water infiltration into sewers (IF), Water losses (WL), Water that is not entering the sewage system (NS). In connection with design of sewers, an estimate of the net quantity of domestic sewage (DS) from the locality is:

Options :

1. ✔ $DS = WS + PS + IF - WL - NS$
2. ✘ $DS = WS + PS - IF - WL - NS$
3. ✘ $DS = WS + PS - IF + WL - NS$
4. ✘ $DS = WS - PS - IF - WL - NS$

Question Number : 103 Question Id : 630680320360 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the air pollution control using wet collectors and the following assertion (A) and reason (R) statements, which of the options is correct?

Assertion (A): Wet scrubbing is a very effective means of removing small particles from a gas.

Reason (R): Removal of particles results from collisions between particles in the gas stream and water drops.

Options :

1. ✓ Both A and R are true and R is the correct explanation of A
2. ✗ Both A and R are true, but R is not the correct explanation of A
3. ✗ A is true, but R is false
4. ✗ Both A and R are false

Question Number : 104 Question Id : 630680320361 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Among the air pollutants, identify the pollutants that do NOT result from the combustion process.

Options :

1. ✗ Sulphur dioxide (SO₂) and Nitrogen dioxide (NO₂)
2. ✓ Hydrogen sulphide (H₂S) and Ozone (O₃)
3. ✗ Ammonia (NH₃) and Nitric oxide (NO)
4. ✗ Sulphur dioxide (SO₂) and Ammonia (NH₃)

Question Number : 105 Question Id : 630680320362 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Study the following statement and conclusions pertaining to noise pollution and select the most appropriate option.

Statement: Noise pollution can be reduced using double glass window panes.

Conclusions:

- 1: The air trapped in the double glass system acts as an insulator and reduces the noise.
- 2: The noise is totally reflected back due to the two layers of glass.

Options :

1. ✓ Only conclusion 1 is correct

2. ✘ Only conclusion 2 is correct
3. ✘ Both conclusions 1 and 2 are correct
4. ✘ Neither conclusion 1 nor 2 is correct

Question Number : 106 Question Id : 630680320363 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The partitioning (movement) of hazardous waste from source to air is:

Options :

1. ✘ solubility
2. ✔ volatilisation
3. ✘ sorption
4. ✘ bioconcentration

Question Number : 107 Question Id : 630680320364 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Which of the following is NOT a constituent of the type of solid waste categorised as 'Rubbish'?

Options :

1. ✘ Paper and card boards
2. ✘ Ceramics, glass bottles
3. ✘ Plastics and rags
4. ✔ Waste from handling, storage and sale of meat and vegetables

Question Number : 108 Question Id : 630680320365 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The order of hierarchy of options in integrated solid waste management (ISWM) (most preferred to least preferred) is:

Options :

1. ✘ recycling, at source reduction and reuse, waste to energy, composting, landfills
2. ✘ at source reduction and reuse, composting, waste to energy, landfills, recycling
3. ✔ at source reduction and reuse, recycling, composting, waste to energy, landfills

4. ✘ composting, waste to energy, landfills, at source reduction and reuse, recycling

Question Number : 109 Question Id : 630680320366 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Following the soil classification as per IS : 1498 – 1970, the group symbol of a soil is assigned as CI. The plasticity index of the soil lies above the A-line when plotted on the plasticity chart. The range of liquid limit values of the soil is:

Options :

1. ✘ 51 to 60
2. ✔ 35 to 50
3. ✘ 20 to 35
4. ✘ 10 to 20

Question Number : 110 Question Id : 630680320367 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Read the given statement and conclusions pertaining to compaction of soils and select the most appropriate option.

Statement:

The effect of increasing the compactive effort is to increase the maximum dry density and to decrease the optimum water content.

Conclusions:

- 1: At a water content less than the optimum, effect of increased compaction is more predominant.
- 2: The higher dry density is achieved up to the optimum water content by forcing water out from the soil solids.

Options :

1. ✔ Only conclusion 1 is correct
2. ✘ Only conclusion 2 is correct
3. ✘ Both conclusions 1 and 2 are correct
4. ✘ Neither conclusion 1 nor 2 is correct

Question Number : 111 Question Id : 630680320368 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the compressibility of soils, and the following assertion (A) and reason (R) statements, select the correct option.

Assertion (A): The slope of the void ratio versus effective stress ($e - \sigma'$) curve, gives the co-efficient of compressibility of soils.

Reason (R): The co-efficient of compressibility increases with an increase in effective stress.

Options :

1. ✘ Both A and R are true and R is the correct explanation of A
2. ✘ Both A and R are true, but R is not the correct explanation of A
3. ✔ A is true, but R is false
4. ✘ Both A and R are false

Question Number : 112 Question Id : 630680320369 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The time required for 50% consolidation of a 30 mm thick clay layer (drained at both top and bottom) in the laboratory is 2 minutes. How long (in hours) will it take for a 3 m thick clay layer of the same clay in the field under the same pressure increment to reach 50% consolidation? In the field, there is a rock layer at the bottom of the clay.

Options :

1. ✘ 4000
2. ✘ 1000
3. ✘ 3000
4. ✔ 2000

Question Number : 113 Question Id : 630680320370 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

If τ_f indicates the shear stress at failure, c' and ϕ' the cohesion and frictional angle, based on the effective stress, identify the correct statement(s).

S1 : For normally consolidated clays, the cohesion c' can be approximated as zero.

S2 : For normally consolidated clays, the friction angle ϕ' can be approximated as zero.

S3 : For over consolidated clay, the friction angle ϕ' can be approximated as zero.

Options :

1. ✔ Only S1
2. ✘ Only S3

3. ✘ Only S1 and S3

4. ✘ Only S2 and S3

Question Number : 114 Question Id : 630680320371 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following statements (S1 and S2) pertain to direct shear test on soils.

S1 : Failure take place along a predetermined failure plane, whose orientation is fixed.

S2 : The friction angle ϕ' , obtained from a drained direct shear test of saturated sand will be nearly the same as that for a similar specimen of dry sand.

Validate the statements as true or false and select the most appropriate option.

Options :

1. ✔ Both S1 and S2 are true

2. ✘ S1 is true and S2 is false

3. ✘ S1 is false and S2 is true

4. ✘ Both S1 and S2 are false

Question Number : 115 Question Id : 630680320372 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Select the correct statement with regards to the direct shear test on sandy soils.

Options :

1. ✘ For sandy soils initially at critical void ratio, the volume change is a maximum with an increase in shear strain.

2. ✘ The void ratio of an initially loose sand increases with increase in shear strain.

3. ✘ The void ratio of an initially dense sand decreases with increase in shear strain.

4. ✔ For sandy soils initially at critical void ratio, there is practically no change in volume with an increase in shear strain.

Question Number : 116 Question Id : 630680320373 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

At every point on the top flow line in a flow net, the pressure head is:

Options :

1. ✘ zero
2. ✔ equal to atmospheric pressure
3. ✘ greater than atmospheric pressure
4. ✘ equal to the pressure head of water causing the flow

Question Number : 117 Question Id : 630680320374 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Determine the shear strength (τ_f) in terms of effective stress on a plane within a saturated soil mass at a point, where the total normal stress is 180 kN/m^2 and the pore water pressure is 80 kN/m^2 . The effective stress shear strength parameters for the soil are cohesion $c' = 16 \text{ kN/m}^2$ and friction angle $\phi' = 30^\circ$. (Take $\tan 30^\circ = 0.6$, $\sin 30^\circ = 0.5$.)

Options :

1. ✘ 34 kN/m^2
2. ✔ 76 kN/m^2
3. ✘ 66 kN/m^2
4. ✘ 60 kN/m^2

Question Number : 118 Question Id : 630680320375 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

According to IS classification system, the number of classifications groups for coarse grained soils (C) and fine grained soils (F), respectively, are:

Options :

1. ✘ C – 10 groups; F – 8 groups
2. ✘ C – 8 groups; F – 7 groups
3. ✔ C – 8 groups; F – 10 groups
4. ✘ C – 9 groups; F – 9 groups

Question Number : 119 Question Id : 630680320376 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Comparing soils with equal plasticity index with liquid limit increasing, the compressibility characteristics:

Options :

1. ✘ remains constant
2. ✘ decreases
3. ✔ increases
4. ✘ decreases and then remains constant

Question Number : 120 Question Id : 630680320377 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The variation of co-efficient of consolidation (C_v) of a soil with respect to the different variables: co-efficient of permeability (k), co-efficient of volume compressibility (m_v) and co-efficient of compressibility (a_v) are given as options. Identify the correct relationship.

Options :

1. ✘ C_v is directly proportional to m_v
2. ✘ C_v is directly proportional to a_v
3. ✘ C_v is inversely proportional to k
4. ✔ C_v is directly proportional to k

Question Number : 121 Question Id : 630680320378 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the items under List 1 (Purpose to be served by foundation) with those under List 2 (Type of pile foundation).

List 1	List 2
P. Transmit heavy load to a strong stratum below a weak stratum	1. Fender piles
Q. Protect water front structures from impact of ships/vessels	2. Sheet piles
R. Densification of loose soils	3. End bearing piles
S. Retain earth filling	4. Compaction piles

Options :

1. ✘ P – 4, Q – 1, R – 2, S – 3
2. ✔ P – 3, Q – 1, R – 4, S – 2
3. ✘ P – 3, Q – 4, R – 1, S – 2
4. ✘ P – 2, Q – 3, R – 4, S – 1

Question Number : 122 Question Id : 630680320379 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Read the given statement and conclusions pertaining to load test on piles and select the most appropriate option.

Statement: Two categories of tests on piles, namely, initial test and routine test are usually carried out.

Conclusions:

- 1: Initial test is carried out on test piles to estimate the allowable load, or to predict the settlement at a working load.
- 2: Routine test is carried out as a check on working piles and to assess the displacement corresponding to the working load.

Options :

1. ✘ Only conclusion 1 is correct
2. ✔ Only conclusion 2 is correct
3. ✘ Both conclusions 1 and 2 are correct
4. ✘ Neither conclusion 1 nor 2 is correct.

Question Number : 123 Question Id : 630680320380 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The ultimate bearing capacity of a shallow foundation is q_u . If D_f is the depth of foundation and γ – unit weight of soil, net safe bearing capacity q_{ns} is given by (take F as the factor of safety):

Options :

1. ✘ $q_{ns} = (q_u + \gamma \cdot D_f)/F$
2. ✘ $q_{ns} = q_u / F - \gamma \cdot D_f$
3. ✘ $q_{ns} = q_u / F + \gamma \cdot D_f$
4. ✔ $q_{ns} = (q_u - \gamma \cdot D_f)/F$

Question Number : 124 Question Id : 630680320381 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time :

N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the settlement of foundation on soils, following IS : 8009 (Part 1) : 1976, and the given assertion (A) and reason (R) statements, which of the options is correct?

Assertion (A): As per IS code, the permissible maximum settlement for multi-storeyed buildings found on sand with isolated foundations is 60 mm and that with raft foundation is 75 mm.

Reason (R): The permissible settlement for raft is more than that of isolated footings, because the raft bridges over soft patches of the soils and differential settlement is reduced.

Options :

1. ✓ Both A and R are true and R is the correct explanation of A
2. ✗ Both A and R are true, but R is not the correct explanation of A
3. ✗ A is true, but R is false
4. ✗ Both A and R are false

Question Number : 125 Question Id : 630680320382 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In a standard penetration test done on a silty fine sand soil, the observed value of penetration number (N) is 11. The corrected value of N is:

Options :

1. ✓ 11
2. ✗ 13
3. ✗ 15
4. ✗ 14

Question Number : 126 Question Id : 630680320383 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

A steel pedestal transmits a concentrated load of 5000 kN, acting vertically at a point on the soil surface. If Boussinesq's equation is used for the computation of stresses, the ratio of vertical stresses at depths 2 m to that at 4 m (below surface), respectively, vertically below the point of application of load is:

Options :

1. ✗ 0.25
2. ✗ 0.5

3. ✘ 2

4. ✔ 4

Question Number : 127 Question Id : 630680320384 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following statements (S1, S2) pertain to the bearing capacity of shallow foundations.

S1: The bearing capacity factors N_c , N_q and N_γ in Terzaghi's bearing capacity equation are functions of angle of shearing resistance of soil.

S2: Terzaghi's theory is applicable when the base of the foundation is smooth.

Validate the statements as true or false and select the most appropriate answer.

Options :

1. ✘ Both S1 and S2 are true

2. ✔ S1 is true and S2 is false

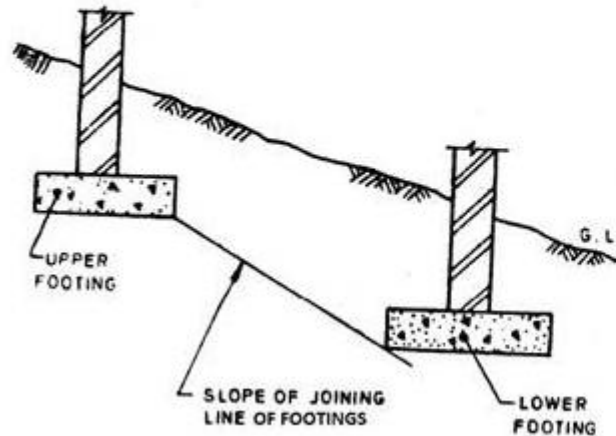
3. ✘ S1 is false and S2 is true

4. ✘ Both S1 and S2 are false

Question Number : 128 Question Id : 630680320385 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Following IS : 1904 – 1986, for foundation provided at different levels, in the case of footings in granular soil, a line drawn between the lower adjacent edges of adjacent footings as in the figure shall NOT have a steeper slope than (limiting value):



Options :

1. ✘ one vertical to one horizontal
2. ✘ one vertical to four horizontal
3. ✔ one vertical to two horizontal
4. ✘ two vertical to one horizontal

Question Number : 129 Question Id : 630680320386 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following statements (S1, S2, S3) pertain to the co-efficient of subgrade reaction of soil.

S1 : The co-efficient of subgrade reaction (k) of soil in the field can be determined by conducting a plate load test.

S2 : For cohesive soils, the value of k increases with depth.

S3 : For cohesionless soils, there is no significant change in the value of k with depth.

Identify the correct statement(s).

Options :

1. ✓ Only S1
2. ✗ Only S2
3. ✗ Only S2 and S3
4. ✗ All S1, S2, S3

Question Number : 130 Question Id : 630680320387 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the negative friction development on piles, and the following assertion (A) and reason (R) statements, which of the options is correct?

Assertion (A): Lowering of ground water table is a possible cause for the occurrence of negative skin friction.

Reason (R): Lowering of water table decreases the effective stress, thereby creating a resultant upward drag on the pile.

Options :

1. ✗ Both A and R are true and R is the correct explanation of A
2. ✗ Both A and R are true, but R is not the correct explanation of A
3. ✓ A is true, but R is false
4. ✗ Both A and R are false

Question Number : 131 Question Id : 630680320388 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the principle of surveying, and the following assertion (A) and reason (R) statements, which of the options is correct?

Assertion (A): One of the fundamental principles of surveying is 'working from part to whole'.

Reason (R): Working from part to whole, prevents the accumulation of errors and thereby controls and localises minor errors.

Options :

1. ✗ Both A and R are true and R is the correct explanation of A
2. ✗ Both A and R are true, but R is not the correct explanation of A
3. ✗ A is true, but R is false
4. ✓ Both A and R are false

Question Number : 132 Question Id : 630680320389 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time :

N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the items under List 1 (Description of levelling) with those under List 2 (Types of levelling).

List 1	List 2
P. Difference in elevation between two points is proportional to the difference in atmospheric pressures at these points.	1. Profile levelling
Q. Elevation of points are computed from the vertical angles and horizontal distances measured in field.	2. Sprit levelling
R. Vertical distances with respect to a horizontal line (perpendicular to direction of gravity) is used to determine the relative difference in elevation between two points.	3. Barometric levelling
S. Determining the elevation of points at short measured intervals along a fixed line (centre line of a road, canal etc)	4. Trigonometric levelling

Options :

1. ✘ P – 4, Q – 3, R – 1, S – 2
2. ✘ P – 2, Q – 1, R – 4, S – 3
3. ✔ P – 3, Q – 4, R – 2, S – 1
4. ✘ P – 4, Q – 1, R – 2, S – 3

Question Number : 133 Question Id : 630680320390 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time :

N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Study the given statement and conclusions pertaining to stadia tacheometry and select the most appropriate option.

Statement: Stadia tacheometry is based on readings taken against the stadia cross hairs and two forms of stadia method (fixed hair and movable hair) are used.

Conclusions:

1 : Fixed hair stadia method, uses a special diaphragm that enable to change the distance between the cross hairs, the intercept is kept constant even though the distance varies.

2: Movable hair method, wherein the distance between the stadia hairs is kept constant, the intercept varies as the distance varies.

Options :

1. ✘ Only conclusion 1 is correct

2. ✘ Only conclusion 2 is correct
3. ✘ Both conclusions 1 and 2 are correct
4. ✔ Neither conclusion 1 nor 2 is correct

Question Number : 134 Question Id : 630680320391 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The zero/360 degree graduation in the graduated ring of a prismatic compass is marked in the:

Options :

1. ✘ North end of the circle
2. ✔ South end of the circle
3. ✘ West end of the circle
4. ✘ East end of the circle

Question Number : 135 Question Id : 630680320392 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the items under List 1 (Name of region in electromagnetic spectrum) with those under List 2 (Wave length values).

†

List 1	List 2
P. Visible region	1. 3 to 14 μm
Q. Near and mid infrared region	2. 1 mm to 1 m
R. Thermal infrared region	3. 0.4 to 0.7 μm
S. Microwave region	4. 0.7 to 3 μm

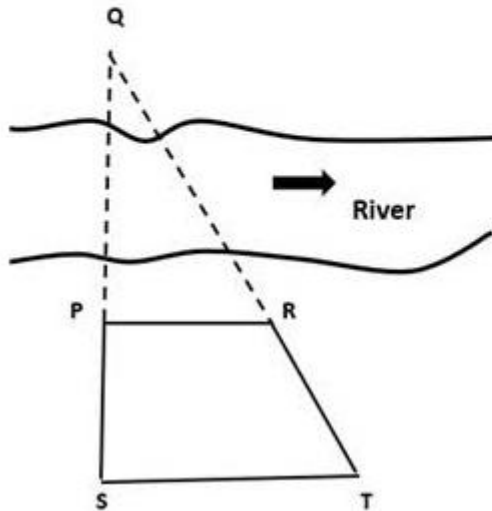
Options :

1. ✘ P – 4, Q – 1, R – 2, S – 3
2. ✔ P – 3, Q – 4, R – 1, S – 2
3. ✘ P – 4, Q – 3, R – 2, S – 1
4. ✘ P – 3, Q – 1, R – 4, S – 2

Question Number : 136 Question Id : 630680320393 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In a chain survey work, in order to determine the length across a river of a continuing chain line, the following observations were made as in the figure. The points S, P, and Q are collinear. Also, the points Q, R, and T are collinear. $PR = PS = 30$ m. The angle SPR is 90° . Distance $ST = 50$ m, angle $PST = 90^\circ$. Determine length PQ .



Options :

1. ✘ 40 m
2. ✘ 30 m
3. ✔ 45 m
4. ✘ 18 m

Question Number : 137 Question Id : 630680320394 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Aerial photographs were taken with a camera having a focal length of 200 mm. The average elevation of the ground in the photograph was 200 m. Determine the scale of the map if the flying height was 2700 m.

Options :

1. ✘ 1 in 13,500
2. ✔ 1 in 12,500
3. ✘ 1 in 14,500
4. ✘ 1 in 12,000

Question Number : 138 Question Id : 630680320395 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Among the different types of resolutions used in remote sensing, spectral resolution is used to indicate:

Options :

1. ✘ sensitivity of the system to small changes in radiation
2. ✘ frequency with which images are obtained
3. ✔ wavelengths to which the remote sensing system is sensitive
4. ✘ ability of the system to distinguish details in the images

Question Number : 139 Question Id : 630680320396 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Study the given statement and conclusions pertaining to Aerial photographic survey of an area and select the most appropriate option.

Statement: Flight planning for aerial photogrammetry survey to be undertaken for an area of 192 km^2 is to be done. The scale of the photograph of size $200 \text{ mm} \times 200 \text{ mm}$ is decided as 1 in 10,000. The longitudinal and side overlaps to be provided for a photograph are 60% and 40%, respectively.

Conclusions:

- 1: The ground area covered in one photograph is 9.6 km^2 .
- 2: The number photographs required to be taken for mapping the whole area is 20.

Options :

1. ✘ Only conclusion 1 is correct
2. ✘ Only conclusion 2 is correct
3. ✘ Both conclusions 1 and 2 are correct
4. ✔ Neither conclusions 1 nor 2 is correct

Question Number : 140 Question Id : 630680320397 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time :

N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Among the errors in chain surveying given as options, identify the error that has a chance to be classified as ‘compensating error’.

Options :

1. ✘ Incorrect length of tape
2. ✘ Error due to sag
3. ✔ Variation in pull
4. ✘ Variation in temperature

Question Number : 141 Question Id : 630680320398 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time :

N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In a compass survey, if the whole circle bearing (WCB) of a line is in between 270 and 360 degrees, the corresponding reduced bearing (RB) for the line can be computed as:

Options :

1. ✔ $RB = 360^\circ - WCB$
2. ✘ $RB = 180^\circ - WCB$
3. ✘ $RB = WCB - 270^\circ$
4. ✘ $RB = 270^\circ - WCB$

Question Number : 142 Question Id : 630680320399 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time :

N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The various stages of engineering surveys for highway alignment are as follows.

P – Preliminary survey
R – Reconnaissance survey
M – Map study
F – Final location and detailed surveys.
Arrange them in the sequential order.

Options :

1. ✘ P – M – R – F
2. ✘ R – P – F – M

3. ✘ R – M – P – F

4. ✔ M – R – P – F

Question Number : 143 Question Id : 630680320400 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Based on the analysis of super elevation, and the following assertion (A) and reason (R) statements, which of the options is correct?

Assertion (A): In a horizontal transition curve, the centrifugal ratio increases along the length of the transition curve.

Reason (R): The super elevation increases along the length of the transition curve.

Options :

1. ✔ Both A and R are true and R is the correct explanation of A

2. ✘ Both A and R are true, but R is not the correct explanation of A

3. ✘ A is true, but R is false

4. ✘ Both A and R are false

Question Number : 144 Question Id : 630680320401 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The concepts/assumptions pertaining to the design of flexible pavements using layered elastic model are given as options. Identify the INCORRECT one.

Options :

1. ✘ Model can compute stresses, strains and deflections at any point in a pavement structure due to a surface load.

2. ✘ Each pavement structural layer is homogeneous, isotropic and will rebound to its original form once the load is removed.

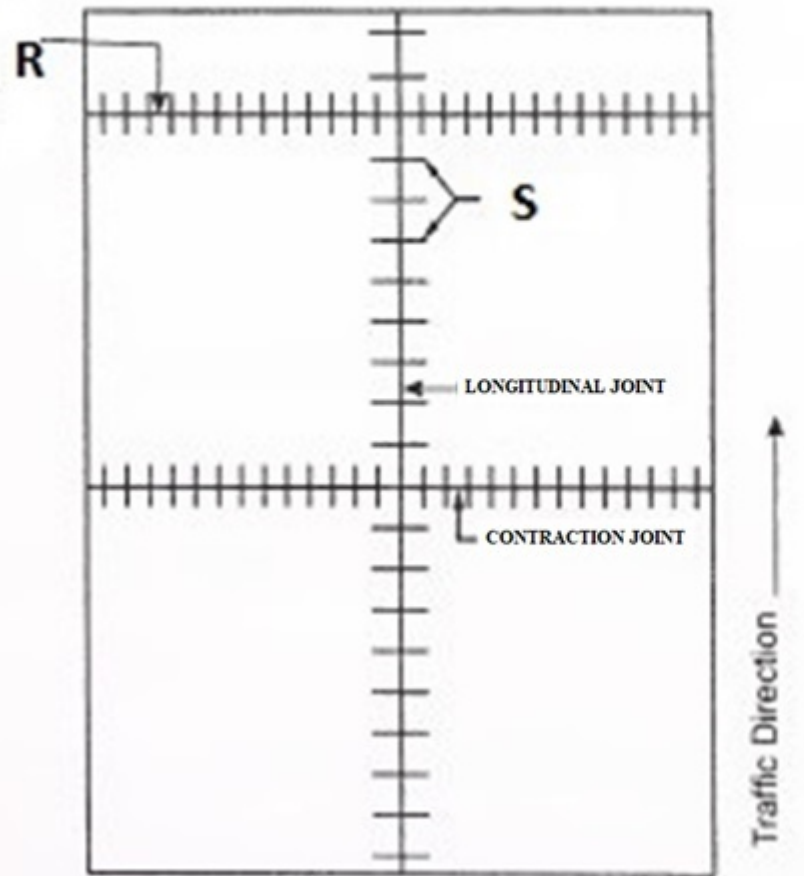
3. ✘ Pavement layer extends infinitely in the horizontal direction.

4. ✔ The bottom layer (subgrade) has finite depth downwards.

Question Number : 145 Question Id : 630680320402 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

In the construction of cement concrete highway pavements, the reinforcement provided at a contraction joint (indicated as R) and that at a longitudinal joint (indicated as S) in the figure, respectively, are known as:



Options :

1. ✓ R – Dowel bar; S – Tie bar
2. ✗ R – Tie bar; S – Dowel bar
3. ✗ R – Tie bar; S – Binder bar
4. ✗ R – Hanger bar; S – Dowel bar

Question Number : 146 Question Id : 630680320403 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Match the items under List 1 (Material property) with those under List 2 (Tests to be performed) for highway construction materials.

List 1	List 2
P. Toughness of aggregates	1. Spot test
Q. Skid resistance of aggregate	2. Ring and ball test
R. Detection of overheated or cracked bitumen	3. Impact test
S. Softening point of bitumen	4. Accelerated polishing test

Options :

1. ✘ P – 2, Q – 4, R – 1, S – 3
2. ✘ P – 3, Q – 4, R – 2, S – 1
3. ✔ P – 3, Q – 4, R – 1, S – 2
4. ✘ P – 4, Q – 3, R – 2, S – 1

Question Number : 147 Question Id : 630680320404 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Arrange the different types of roads on the basis of the decreasing value of cambers (high to small values), so as to facilitate drainage of rain water from pavement surface on a heavy rainfall area. Follow the IRC recommended values of Camber for different roads. Use the codes: ER – Earth road, CC – Cement concrete road, WBM – Water bound macadam road, BM – Thin bituminous surface road.

Options :

1. ✔ ER, WBM, BM, CC
2. ✘ ER, BM, WBM, CC
3. ✘ WBM, ER, CC, BM
4. ✘ CC, BM, WBM, ER

Question Number : 148 Question Id : 630680320405 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

The following statements (S1, S2) pertain to pavement deterioration.

S1: Rate of deterioration of bituminous pavement increases rapidly when water is retained in the void spaces of bituminous pavement layers.
S2: In flexible pavements, the structural deterioration takes place due to the repeated application of heavy wheel load leading to fatigue in pavement.

Validate the statements as true or false and select the most appropriate option.

Options :

1. ✘ Both statements S1 and S2 are true
2. ✔ Statement S1 is true, but statement S2 is false
3. ✘ Statement S1 is false, but statement S2 is true
4. ✘ Both statements S1 and S2 are false

Question Number : 149 Question Id : 630680320406 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

Which of the following is NOT a method used for data collection for origin and destination studies in traffic engineering?

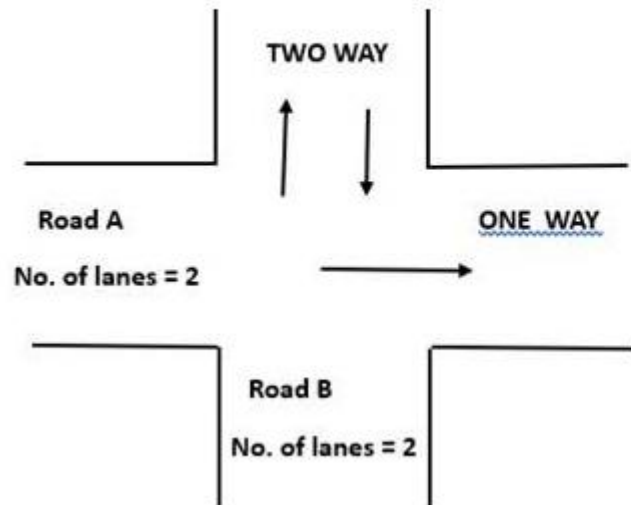
Options :

1. ✘ Return post card method
2. ✘ Tag on car method
3. ✔ Floating car method
4. ✘ Road side interview method

Question Number : 150 Question Id : 630680320407 Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1 Wrong Marks : 0.33

An uncontrolled intersection of two roads is shown in the figure. Road A (two lane, one way traffic); Road B (two lane, two way traffic). The number of potential conflict points at this intersection is:



Options :

1. ✘ 24
2. ✔ 11
3. ✘ 6
4. ✘ 17