समीक्षा

RSSB JE 2026

HYBRID TEST SERIES

SOLUTION

Paper ID

515

Stream

Civil Engineering (B.Tech)

ACCURATE ANSWERS
Every answer is precise & reliable

DETAILED EXPLANATIONS
Concept clarity with step-by-step solutions

BETTER PREPARATION
Improve performance & achieve success

Exam Date
15 NOV. 2026

Subject
FULL SYLLABUS (TECH + NON-TECH)
PAPER - 01

Click to Enroll zonetech.in/rssb-je-test-series

|| आपकी सफलता, हमारी प्रतिबद्धता ||

1. Answer D

Solution

Statement A is true

Low-heat cement is manufactured by reducing the proportion of tricalcium aluminate (C_3A and usually also C_3S) while increasing the proportion of dicalcium silicate (C_2S). This lowers the heat of hydration, making the cement suitable for mass concreting (dams, large foundations, etc.).

Statement B is false

Rapid-hardening cement (also called high-early-strength cement) is produced by increasing the amount of tricalcium silicate (C_3S) and grinding the cement more finely. Higher C_3S content gives rapid early strength development. Decreasing C_3S would slow down strength gain, which is the opposite of what is required.

2. Answer B

Solution

Statement 1 is correct: For a good quality (first-class) brick, the crushing or compressive strength should not be less than 10 N/mm².

Statement 2 is correct: A good quality brick should not absorb more than 20% of its dry weight when immersed in water for 24 hours.

Statement 3 is incorrect: Brick earth should be entirely free from stones, pebbles, kankar, organic matter, and saltpeter. The presence of saltpeter causes efflorescence, while stones weaken the structural homogeneity of the brick.

3. Answer A

Solution

Statement 1 is correct: Angular aggregates have a higher percentage of voids (typically 38% to 45%) due to their jagged edges. This increases the surface area, requiring more water-cement paste for lubrication, which results in less workability. However, the interlocking nature of their sharp edges gives a superior mechanical bond, leading to higher strength.

Statement 2 is incorrect: The test based on the percentage flow (ranging from 0 to 150 percent) is the Flow Table Test, not the Vee-Bee test. The Vee-Bee test determines workability by measuring the time (in Vee-Bee seconds) it takes for a concrete mass to change from a slump cone shape into a cylinder under mechanical vibration.

4. Answer D

Solution

Statement A is correct

In **general shear failure** (typical of dense sand or stiff clay), continuous and well-defined slip surfaces develop from the edges of the footing and extend all the way up to the ground surface. There is clear heaving of the soil around the foundation and a distinct peak in the load–settlement curve.

Statement B is incorrect

Local shear failure (typical of medium-dense sand or medium clay) is not sudden. The failure surfaces are only partially developed and do not clearly reach the ground surface. There is only slight bulging of the soil, progressive settlement, and **no tilting** of the footing.

5. Answer C

Solution

S1: Correct. According to the Kozeny-Carman equation, At a given porosity (which fixes the void ratio e), permeability is inversely proportional to the square of the specific surface area ($k \propto \frac{1}{S_v^2}$) where (S_v) is the specific surface area per unit volume.

S2: Incorrect. Consolidation is a function of effective stress, not total stress. Water drains out of the soil pores as excess pore water pressure dissipates, transferring the load to the soil skeleton (increasing effective stress).

S3: Incorrect. For a fully saturated soil, Skempton's pore pressure parameter (B) is equal to **1** (not zero). A value of zero corresponds to a completely dry soil.

S4: Correct. One of the fundamental assumptions of Terzaghi's one-dimensional consolidation theory is that it only considers primary consolidation (due to the expulsion of pore water) and completely neglects secondary compression (due to plastic readjustment of soil solids).

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

6. Answer A

Solution

Analysis of the statements for a horizontal venturimeter:

Continuity equation → velocity is higher at the throat (smaller cross-sectional area).

Bernoulli's equation → pressure is lower at the throat.

Therefore:

A is incorrect — Velocity in the main pipe is lower (not greater) and pressure is higher (not lesser) than at the throat.

B is correct — Velocity in the main pipe is lower and pressure is larger than at the throat.

C is correct — Pressure difference ($P_{main}-P_{throat}$) is positive.

D is incorrect — The pressure difference is positive, not negative.

7. Answer A

Solution

Evaluation of the statements:

1. Incorrect

   When the depth of flow changes abruptly over a short length of the channel, the flow is called Rapidly Varied Flow (RVF) (e.g., hydraulic jump).

   Gradually Varied Flow (GVF) is the case in which depth changes gradually over a long distance.

2. Incorrect

   If velocity, depth or discharge at a point changes with respect to time, the flow is unsteady.

   Steady flow means that these quantities do not change with time.

3. Correct

   When velocity, depth, slope or cross-section vary along the length of the channel, the flow is non-uniform.

   (Uniform flow requires that these parameters remain constant along the channel.)

8. Answer D

Solution

All three instruments are used in chaining (chain surveying / linear measurement with chain or tape):

Chain or Tape (III) — Primary instrument for measuring horizontal distances.

Ranging rods (I) — Used to mark intermediate points and keep the measurement line straight (ranging).

Plumb bob (II) — Used to transfer points vertically to the ground (especially on sloping ground) and to check the verticality of ranging rods.

9. Answer B

Solution

Statement 1 is TRUE: Both the Two-point problem and the Three-point problem are specialized methods of resection (which simultaneously achieves orientation). The primary goal of a two-point problem is to locate the position of the plane table on the drawing sheet by sighting two well-defined, previously plotted points.

Statement 2 is FALSE: The Three-point problem is a special case of the resection method, NOT the radiation method. The radiation method is used to locate and plot the positions of objects on a drawing sheet from a single instrument station, whereas the three-point problem is specifically used to determine the unknown location of the instrument station itself by sighting three known points.

10. Answer B

Solution

Statement 1: Correct

Traffic density is defined as the number of vehicles occupying a unit length of a traffic lane at a given instant.

$[\ k = \frac{N}{L}\ ]$

Where:

(k) = Traffic density (vehicles/km)

(N) = Number of vehicles

(L) = Length of road (km)

Statement 2: Correct

Sight distance is defined as the length of road ahead visible to the driver at any instant.

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

11. Answer A
Solution
Both A and R are correct, and R is the correct explanation of A. Six holes have been found in the skull of a child's skeleton at Kalibangan, which is considered evidence of the treatment of a brain-related ailment.
A और R दोनों सही है और R, A की सही व्याख्या है। कालीबंगा से एक बच्चे के कंकाल की खोपड़ी में छः छिद्र मिले हैं, जिसे मस्तिष्क शोध बीमारी के इलाज का प्रमाण माना जाता है।

12. Answer C
Solution
Coins of various princely states:
- Jodhpur: Vijay-shahi (Baissanda), Gaj-shahi, Dhabbu-shahi
- Jaipur: Jhar-shahi, Muhammad-shahi, Hali, Gadhiya
- Bikaner: Alam-shahi, Ganga-shahi
- Jaisalmer: Akhai-shahi, Muhammad-shahi, Dodiya (copper coin)

विभिन्न रियासतों के सिक्के :
- जोधपुर : विजयशाही (बाईसन्दा), गजशाही, ढब्बूशाही
- जयपुर : झाड़शाही, मुहम्मदशाही, हाली, गधिया
- बीकानेर : आलमशाही, गंगाशाही
- जैसलमेर : अखैशाही, मुहम्मदशाही, डोडिया (ताँबे का)

13. Answer D
Solution
Sawai Jai Singh bestowed the title of 'Brajraj' and the jagir of Deeg upon Badan Singh of Bharatpur.
सवाई जयसिंह ने भरतपुर के बदन सिंह को ब्रजराज की उपाधि तथा डीग की जागीर दी थी।

14. Answer D
Solution
- Maharana Jai Singh: 1680–1698 CE
- Maharana Amar Singh II: 1698–1710 CE
- Maharana Sangram Singh II: 1710–1734 CE
- Maharana Jagat Singh II: 1734–1751 CE
- महाराणा जयसिंह : 1680 - 1698 ई.
- महाराणा अमर सिंह द्वितीय : 1698 - 1710 ई.
- महाराणा संग्रामसिंह द्वितीय : 1710 - 1734 ई.
- महाराणा जगतसिंह द्वितीय : 1734 - 1751 ई.

15. AnswerB
Solution
- The Alai Mosque and the two-storeyed Rani Mahal are located within the Jalore Fort.
- अलाई मस्जिद व दो मंजिला रानी महल जालौर दुर्ग में स्थित है।

16. Answer B
Solution
- Temple of the Nine Planets (Navagraha Mandir) – Kishangarh (Ajmer)
- Dargah of Khwaja Fakhruddin – Sarwar (Ajmer)
- Peepaldhar Bhimshah Temple – Abu (Sirohi)
- नौ ग्रहों का मन्दिर - किशनगढ़ (अजमेर)
- ख्वाजा फखरुद्दीन की दरगाह - सरवाड़ (अजमेर)
- पीपलधर भीमशाह मंदिर - आबू (सिरोही)

17. Answer B
Solution
(Major Sects) - (Founders)
A. Nishkalank - Sant Mavji
B. Gaudiya - Chaitanya Mahaprabhu
C. Alakhia - Swami Lal Giri
D. Niranjani - Sant Haridas Ji
(प्रमुख सम्प्रदाय) - (प्रवर्तक)
A. निष्कलंक - सन्त मावजी
B. गौड़ीय - चैतन्य महाप्रभु
C. अलखिया - स्वामी लाल गिरी
D. निरंजनी - सन्त हरिदास जी

18. Answer A
Solution
Both A and R are correct, and R is the correct explanation of A.
A और R दोनों सही है और R, A की सही व्याख्या है।

19. Answer B
Solution
Statement 1 – True
Rigid (concrete) pavements experience:
Warping stresses due to temperature gradient between the top and bottom of the slab, and
Frictional stresses due to the restraint offered by the subgrade/base against expansion or contraction of the slab caused by overall temperature changes.
Statement 2 False
In flexible pavements, wheel-load stresses are highest at the surface and decrease with depth. The top layers experience the maximum intensity of stresses; the bottom layers experience the least. (This is why higher-quality materials are used in the upper layers.)

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

20. Answer D

Solution

Statement A – Correct

Contour interval is the constant vertical distance (difference in elevation) between any two consecutive contour lines on a map.

Statement B – Correct

Horizontal equivalent is the horizontal distance measured between any two consecutive contour lines. Unlike the contour interval (which is fixed for a given map), the horizontal equivalent varies according to the slope of the ground (smaller on steeper slopes and larger on flatter slopes).

21. Answer A

Solution

Statement 1 is correct in standard prestressed-concrete literature (e.g., T.Y. Lin). Prestressed concrete is regarded as a form of reinforced-concrete construction in which the prestress is introduced by tensioning the high-strength steel reinforcement (tendons) and anchoring it against the concrete.

Statement 2 is correct

This is the basic principle of prestressing: compressive stress is deliberately induced in the concrete (before external loads act) in those zones that will later experience tensile stress under service loads. The pre-compression counteracts the tensile stresses, thereby improving cracking resistance and structural performance.

22. Answer A

Solution

Statement A is CORRECT: By structural definition, the neutral axis is the specific layer or line in a beam's cross-section where the bending stress and bending strain are exactly zero. As a result, it acts as the clear boundary that separates the compression zone (where fibers undergo shortening) from the tension zone (where fibers undergo elongation).

Statement B is INCORRECT: Standard design codes (like IS 456) require that the actual depth of the neutral axis (x_u) must be kept less than or equal to the maximum or limiting depth of the neutral axis (x_{umax}). Limiting the depth this way keeps the structural element designed as an under-reinforced section, ensuring a safe, ductile failure instead.

23. Answer B

Solution

According to Motilal Menaria, "A poetic work that contains a detailed account of a king's renown, victories, battles, valor, etc., is termed a 'Raso'." An example of this is the 'Ratan Raso' by Kumbhakarna. In Rajasthan, 'Raso' literature emerged in the 11th century.

रासो - मोतीलाल मेनारिया के अनुसार, "जिस काव्य ग्रंथ में किसी राजा की कीर्ति, विजय, युद्ध, वीरता आदि का विस्तृत वर्णन हो, उसे रासो कहते हैं।" उदाहरणार्थ - कुम्भकर्ण का 'रतन रासो'। राजस्थान में रासो साहित्य की शुरुआत 11वीं सदी में हुई।

24. Answer C

Solution

Meghraj Mukul was born in Rajgarh (Churu). His notable works include 'Sainani' (which describes the incident where Hada Rani severed her own head), 'Kodmare', 'Aan Ri Baat', 'Durgavati', and 'Chanvari'.

मेघराज मुकुल - इनका जन्म राजगढ़ (चुरू) में हुआ था। 'सैनाणी (हाड़ा रानी द्वारा सिर काटने की घटना का वर्णन), कोडमरे, आण री बात, दुरगावती, चँवरी' आदि इनकी प्रमुख रचनाएँ हैं।

25. Answer D

Solution

The Thadri festival is celebrated by the Sindhi community on the seventh day of the dark fortnight (Krishna Paksha) of the month of Bhadrapada. On this day, people consume cold food that was prepared the previous day.

थदड़ी त्योहार सिन्धी समुदाय द्वारा भाद्रपद कृष्ण पक्ष की सप्तमी को मनाया जाता है। इस दिन एक दिन पहले बना हुआ ठण्डा भोजन किया जाता है

26. Answer D

Solution

Pagdi Bandhna / Pag Dastur – A ritual performed on the day of the mausar (post-funeral feast/ceremony), in which a turban (pagdi/pag) is tied on the eldest son of the deceased, formally declaring him the successor.

पगड़ी बाँधना / पाग दस्तूर - मौसर वाले दिन मृत व्यक्ति के सबसे बड़े पुत्र को पगड़ी / पाग बाँधकर उत्तराधिकारी घोषित करने की रस्म।

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

27. Answer B
Solution
Statement A – Correct
Intermediate transverse stiffeners divide the web into smaller panels. This reduces the panel aspect ratio and significantly increases the critical shear buckling stress of the web, thereby enhancing its resistance to shear buckling.
Statement B – Correct
If the actual (computed) shear stress in the web is lower than the elastic critical shear stress of the unstiffened web, the web will not buckle under shear. In that case intermediate transverse stiffeners are theoretically not required (only load-bearing/end stiffeners may still be needed).

28. Answer C
Solution
Statement 1 is CORRECT: According to the Indian Standard Code IS 800 (Working Stress Method), the maximum permissible bearing stress (σ_p) on the projected area of a contact surface is taken as $0.75f_y$ (where f_y is the minimum yield stress of the steel). This design limit is explicitly used to ensure safety against crushing in structural connections and column base plates.
Statement 2 is INCORRECT: The ridge formed by the intersection of two sloping roof surfaces where the exterior angle is greater than 180° is called a Hip (a convex intersection). Conversely, a Verge is defined as the edge of a roof that runs along the gable end between the eaves and the ridge line.

29. Answer B
Solution
Straight-line method
A fixed (constant) amount of depreciation is charged every year. It is calculated on the original cost of the asset (minus residual value) and does not use a percentage of the current book value.
Reducing balance method (also called declining-balance or written-down-value method)
A constant percentage is applied each year to the current book value (i.e., the reducing balance) of the asset. This is exactly the method described in the question.
Sum-of-the-years'-digits method
Depreciation is calculated by applying a decreasing fraction (based on the sum of the years' digits) to the depreciable amount. It does not use a constant percentage of the current value.

30. Answer C
Solution
Assessed value is the value assigned to a property by local tax authorities for the purpose of calculating property taxes.
Many jurisdictions provide homestead exemptions or preferential tax treatment for properties that serve as the owner's primary residence. These benefits reduce the taxable (assessed) value for owner-occupants. Rental properties owned by landlords generally do not qualify for the same exemptions, so their assessed value (for tax purposes) is typically higher.
The other values do not systematically differ on the basis of owner-occupancy versus landlord ownership:
Market value is determined by open-market conditions.
Book value is an accounting figure.
Salvage value is the residual value at the end of useful life.

31. Answer A
Solution
Statement (i) is TRUE & Statement (ii) is FALSE:
According to Hazen's classic ideal sedimentation theory, the removal efficiency (η) of a discrete particle is given by the ratio of its settling velocity (V_s) to the Surface Overflow Rate (SOR) V_o:

$$\eta = \frac{V_s}{V_o} \times 100$$

The Surface Overflow Rate is calculated as the discharge (Q) divided by the surface area ($A_s = LB$) of the tank:

$$V_o = \frac{Q}{L \times B}$$

Substituting (V_o) into the efficiency equation shows that for a given discharge, settling efficiency depends strictly on the plan/surface area (L B) and is independent of the depth (D) of the tank. While increasing the depth changes the detention time, it simultaneously increases the vertical distance the particle must fall to hit the floor, meaning the two depth effects mathematically cancel each other out.
Statement (iii) is FALSE:
Increasing the surface overflow rate V_o increases the upward velocity of the water leaving the basin. Since a higher V_o makes it harder for slow-settling particles to reach the floor before escaping, it **decreases the settling efficiency** rather than increasing it. To maximize efficiency, the surface overflow rate needs to be reduced.

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

32. Answer B

Solution

(a) **Correct** Air valves (air-relief or air-release valves) are installed at summits (high points) of a pipeline to release trapped air during filling/operation and to admit air during emptying, thereby preventing vacuum formation.

(b) **Incorrect** Sluice valves (a type of gate valve) are used for isolation or on/off control of flow. They do not prevent backflow. Prevention of backflow is the function of check valves (also called non-return valves or reflux valves).

(c) **Correct** Scour valves (also called wash-out valves) are provided at the lowest points of a pipeline so that the pipe can be completely emptied for cleaning, inspection or repair.

(d) **Correct** Gate valves are commonly used to regulate (start, stop or throttle) the flow of water in pipelines.

33. Answer D

Solution

The pressure at a depth hhh in a liquid is given by P=ρgh

(where ρ is the density of the liquid and g is acceleration due to gravity).

This pressure depends only on the vertical height of the liquid column above the point and is independent of the shape or cross-sectional area of the container (hydrostatic paradox).

In the given figure, all three containers are filled with water to the same height. Therefore the pressure at the bottom of each container is the same:

$P_1=P_2=P_3$

34. Answer B

Solution

For the stable equilibrium of a floating body M should be above G (A – 2)

For the stable equilibrium of a sub-merged body B should be above G. (B–3)

C and D are opposite to A and B.

35. Answer C

Solution

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}=0$$

(i) u = kx ; v = ky

$$\Rightarrow \frac{\partial}{\partial x}(kx)+\frac{\partial}{\partial y}(ky)=k+k=2k\neq 0$$

(ii) $u = kx^2y^2$, $v = ky^2$

$$\Rightarrow \frac{\partial}{\partial x}kx^2y^2+\frac{\partial}{\partial y}ky^2=2kxy^2+2ky\neq 0$$

(iii) u = – kx, v = ky

$$\Rightarrow \frac{\partial}{\partial x}(-kx)+\frac{\partial}{\partial y}ky=-k+k=0$$

Continuity equation for incompressible flow is satisfied.

36. Answer B

Solution

Number of rain gauge stations n = 4

Average rainfalls = 105, 79, 70 & 66 cm

Coefficient of variation C_v = 21.9%

$$n=\left(\frac{C_v}{E}\right)^2$$

$$4=\left(\frac{21.9}{E}\right)^2$$

E= 10.95%

Percentage of accuracy = 100 – E

= 100 – 10.95 = 89.05%

37. Answer A

Solution

Thiessen Polygon - Average depth of rainfall over an area

The Thiessen Polygon method is a graphical technique used to compute the average areal depth of precipitation over a catchment basin by assigning proper weight factors to each rain gauge station based on its area of influence.

Mass curve - Relationship of accumulated rainfall and time

A rainfall mass curve is a plot showing the cumulative or accumulated depth of rainfall over a specific time duration. Because it tracks accumulated totals, its slope never decreases over time.

Hyetograph - Relationship of rainfall intensity and time

A hyetograph is a bar chart or graph showing the distribution of rainfall intensity over time (usually expressed in mm/hour versus hours).

DAD curve - Always a falling curve

A Depth-Area-Duration (DAD) curve represents the relationship between maximum average rainfall depth and the storm area for a given duration. Because the average rainfall intensity drops as the storm area increases outward from the eye of the storm, a DAD curve is always a falling curve as you move along the area axis.

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

38. Answer C

Solution

Area = 30,000 Ha

Time (hr)	4hr UHG (m^3/s)	S–curve additions (m^3/s)	S–curve ordinates (m^3/S)
0	0	-	0
1	6	-	6
2	36	-	36
3	66	-	66
4	91	0	91
5	106	6	112
6	93	36	129
7	79	66	145

39. Answer D

Solution

$I_0 = 20\ m^3/s$, $I_1 = 40\ m^3/s$

$Q_o = 11\ m^3/s$, $Q_1 = ?$

$C_0 = 0.05$, $C_1 = 0.55$

$C_2 = 1 - C_0 - C_1 = 1 - 0.05 - 0.55 = 0.4$

$Q_1 = C_0I_1 + C_1I_O + C_2Q_o$

$= (0.05 \times 40) + (0.55 \times 20) + (0.4 \times 11)$

$= 17.4\ m^3/s$

40. Answer C

Solution

P. Unconfined aquifer - 3. Water Table aquifer

An unconfined aquifer is a water-bearing stratum where the upper water surface (the water table) is at atmospheric pressure. Because its upper boundary is the water table, it is commonly called a water table aquifer.

Q. Confined aquifer - 4. Artesian aquifer

A confined aquifer is sandwiched between two impermeable layers, keeping the water inside under pressure greater than atmospheric pressure. When a well penetrates this layer, water rises above the aquifer level, which is why it is called an artesian aquifer.

R. Aquitard - 1. Insignificant yield

An aquitard is a saturated, poorly permeable geological formation (like sandy clay). While it can store water and allow slow seepage between aquifers, it cannot transmit water fast enough to provide an adequate supply to wells, resulting in an insignificant yield.

S. Aquiclude - 2. Impermeable to flow of water

An aquiclude is a highly porous formation that contains a large amount of water but is completely impermeable to its flow due to extremely small pore sizes (like pure clay).

It prevents any effective movement or transmission of groundwater.

41. Answer C

Solution

P. Field capacity - 3. Maximum quantity of water that a given soil can retain against force of gravity

Field capacity represents the moisture content remaining in the soil after excess gravitational water has fully drained away (usually 2 to 3 days after a heavy rain or irrigation). It is the upper limit of available water for plants.

Q. Permanent wilting point - 4. Moisture content of a soil at which the water is no longer available in sufficient quantity to sustain plants

This is the lower limit of available water. At this stage, the soil grains hold onto water film so tightly due to surface tension that plant roots cannot exert enough suction to extract it, causing the plants to permanently wilt.

R. Specific yield - 1. Volume of water that can be extracted by force of gravity from a unit volume of saturated earth material In groundwater hydrology, specific yield (S_y) is the ratio of the volume of water that a saturated soil or rock will yield by gravity to the total volume of that material. (The remaining un-drainable portion is called specific retention).

S. Infiltration capacity - 2. Maximum rate at which a soil can absorb water through its surface

Infiltration capacity (f_p) dictates the maximum rate at which water can enter a specific soil under a given set of conditions. If the rainfall rate exceeds this capacity, surface runoff begins to accumulate.

42. Answer C

Solution

In case of trickle irrigation evaporation losses from the land surface are minimal but not completely eliminated.

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

43. Answer D

Solution

Shear friction factor

$$= \frac{\mu\Sigma V + b \times 1 \times q}{\Sigma H}$$

$$= \frac{\mu\Sigma v}{\Sigma H} + \frac{b \times 1 \times q}{\Sigma H}$$

Friction factor against sliding = $= \frac{\mu\Sigma V}{\Sigma H} = 1.05$

$$S.F.F = 1.05 + \frac{70 \times 1 \times 1.4}{40}$$

= 1.05 +2.45 = 3.5

44. Answer D

Solution

Desert Triangle: To develop tourist destinations in the state's western desert districts—Jaisalmer, Jodhpur, and Bikaner—the region is being developed as a 'Desert Triangle' with financial assistance from the Japanese organization JBIC (formerly known as OECF).

मरु त्रिकोण : राज्य के पश्चिमी मरुस्थलीय जिलों जैसलमेर, जोधपुर एवं बीकानेर के पर्यटन स्थलों के विकास हेतु इन्हें मरु त्रिकोण के रूप में जापान की संस्था JBIC (पूर्वनाम OECF) की वित्तीय सहायता से विकसित किया जा रहा है।

45. Answer A

Solution

The army of Jhalawar joined Tatya Tope, and the revolutionaries took control of Jhalawar after deposing (and taking captive) its ruler, Prithvi Singh.

झालावाड़ की सेना तांत्याटोपे से मिल गई एवं शासक पृथ्वीसिंह को अपदस्थ (बंदी बनाकर) कर झालावाड़ पर क्रांतिकारियों ने अधिकार कर लिया।

46. Answer C

Solution

The Bikaner Praja Mandal was established in Calcutta in 1936 AD.

Founding members: Magharam Vaidya, Babu Mukta Prasad, Lakshmidevi Acharya (female), and Raghubar Dayal Goyal.

The Dudhwa Khara farmers' movement in Bikaner was led by Hanuman Singh Arya in 1944.

1936 ई. में कलकत्ता में बीकानेर प्रजामण्डल की स्थापना की गई।

संस्थापक सदस्य : मघाराम वैद्य, बाबू मुक्ता प्रसाद, लक्ष्मीदेवी आचार्य (महिला) एवं रघुवर दयाल गोयल।

बीकानेर के दूधवा खारा किसान आन्दोलन का नेतृत्व 1944 में हनुमान सिंह आर्य ने किया।

47. Answer B

Solution

Paropkarini Sabha/ परोपकारिणी सभा -1883 A.D.

Veer Bharat Sabha/ वीर भारत सभा – 1910 A.D

Desh Hitaishini Sabha/ देश हितैषिणी सभा - 1877 A.D.

Rajputana Harijan Sabha/ राजपूताना हरिजन सभा- 1934 A.D.

48. Answer C

Solution

The Socialist Party called for a 'Greater Rajasthan' (Brihat Rajasthan). To this end, the party established the 'Rajasthan Movement Committee' (Rajasthan Andolan Samiti) at an all-India level to advocate for the creation of a unified Rajasthan.

On November 9, 1948, while addressing a public meeting in Udaipur, Socialist leader Jayaprakash Narayan demanded the formation of a 'Greater Rajasthan' at the earliest possible opportunity.

- Socialist leader Ram Manohar Lohia demanded the creation of a 'Greater Rajasthan' by incorporating Jaipur, Bikaner, Jaisalmer, and the Matsya region into a unified Rajasthan.

समाजवादी दल ने वृहत् राजस्थान के लिए आह्वान किया। समाजवादी दल ने अखिल भारतीय स्तर पर एकीकृत राजस्थान की स्थापना के लिए 'राजस्थान आन्दोलन समिति' का गठन किया।

समाजवादी नेता जयप्रकाश नारायण ने 9 नवम्बर, 1948 ई. को उदयपुर में एक आम सभा को उद्बोधित करते हुए शीघ्रातिशीघ्र वृहत् राजस्थान के निर्माण की मांग की।

- समाजवादी नेता राममनोहर लोहिया ने जयपुर, बीकानेर, जैसलमेर और मत्स्य प्रदेश को संयुक्त राजस्थान में मिलाकर वृहत् राजस्थान की मांग की।

49. Answer B

Solution

Among the statements mentioned above, only statement 2 is incorrect (Hanumangarh was formed on July 12, 1994); therefore, based on the given options, option 2 is to be considered the correct one.

उपर्युक्त कथनों में सिर्फ कथन 2 गलत (हनुमानगढ़ का गठन - 12 जुलाई 1994) है, अतः विकल्पानुसार विकल्प 2 सही माना जायेगा।

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

50. Answer B

Solution

The Aravalli range was formed during the Precambrian era, not the Pleistocene epoch.

The total length of the Aravalli mountain range is approximately 692 km, of which about 550 km lies within Rajasthan—accounting for roughly 80% of its total length.

अरावली का निर्माण प्रीकैम्ब्रियन युग में हुआ था, न कि प्लीस्टोसीन काल में।

अरावली पर्वतमाला की कुल लंबाई लगभग 692 किमी है। जिसमें से लगभग 550 किमी भाग राजस्थान में स्थित है, जो कुल लंबाई का लगभग 80% है।

51. Answer A

Solution

A. Minimum daily flow / average daily flow - 4. (2/3) (or 0.67):

The minimum water demand on any single day of the year drops down to roughly two-thirds (67%) of the overall annual average daily demand.

B. Minimum hourly flow / average daily flow - 1. (1/3) (or 0.33): During the late-night or early-morning hours, water consumption drops to its absolute lowest, typically hitting about one-third (33%) of the average daily flow.

C. Maximum daily flow / average daily flow - 2. (2) (or 1.8): The peak water consumption on the highest-demand day of the year usually spikes to approximately (1.8) to (2.0) times the average daily flow.

D. Maximum hourly flow / average daily flow - 3. (3) (or 2.7): The peak hourly water demand during morning rush hours on the maximum consumption day spikes sharply, reaching around (2.7) to (3.0) times the average daily flow.

52. Answer C

Solution

Hardness as $CaCO_3$: Acceptable and desirable limits for general domestic and potable water hardness typically range between 75 to 115 ppm (mg/L).

Turbidity (on silica scale): The permissible limit for drinking water is generally limited to 10 ppm (or 5–10 NTU), making option (a) incorrect.

Color (on cobalt/platinum-cobalt scale): The maximum permissible color for domestic supplies is typically 5 to 20 TCU/ppm (often capped at 5 to 10 ppm for acceptable standards and 15 max), making 15–25 ppm in option (b) outside standard ideal/permissible limits.

BOD (Biochemical Oxygen Demand): Potable domestic water should have a BOD of 0 ppm, as any measurable biological oxygen demand indicates organic contamination.

53. Answer B

Solution

Settling velocity = V_s= 6 m/hr

Over flow rate = V= 3.5 m/hr

The % of particles that can be removed

$$= \frac{V_s}{V} \times 100 = \frac{6}{3.5} \times 100$$

= 171.4

Particles removed is > 100% (i.e 171.4)

∴ % of removal is 100% only

54. Answer D

Solution

Statement 1: Correct. In a continuous flow type sedimentation tank, particles are removed 100% if their settling velocity (v_s) is greater than or equal to the surface loading rate (surface overflow rate, (v_o).

Statement 2: Incorrect. In a continuous flow type sedimentation tank, water moves horizontally while particles settle downward with a resultant velocity (a combination of horizontal flow velocity and vertical settling velocity), meaning they do not move purely vertically down to the bottom.

Statement 3: Correct. When a coagulant (such as alum) is added to water containing natural or added alkalinity, it reacts with the alkalinity (e.g., calcium bicarbonate) to form an insoluble metal hydroxide precipitate (like aluminum hydroxide, $Al(OH)_3$.

Statement 4: Incorrect. Flocculation is the process of **gentle/slow mixing** (not vigorous mixing) to encourage destabilized particles to collide and aggregate into larger flocs. Vigorous mixing belongs to the rapid/flash mixing (coagulation) stage

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

55. Answer C
Solution
Carmen – Kozney equation → Head loss in filters
Chick's law → Rate of killing of bacteria

56. Answer D
Solution
$N_o = 10^8$ $N_t=10^4$
$Log(R) = \log_{10}(N_0) - \log_{10}(N_t)$
$= \log_{10}(10^8) - \log_{10}(10^4)$
$= 8 - 4 = 4$

57. Answer C
Solution
First Stage BOD (Carbonaceous Demand): Represents the oxygen consumed by heterotrophic bacteria to oxidize organic carbon compounds. This usually occurs over the first 5 to 8 days.
Second Stage BOD (Nitrogenous Demand): Represents the oxygen consumed by autotrophic nitrifying bacteria (Nitrosomonas and Nitrobacter) to convert ammonia and organic nitrogen into nitrites and nitrates. This nitrification process usually begins after about 5 to 10 days, once the carbonaceous organic matter is significantly reduced.

58. Answer B
Solution
P. Proportional weir - 3. Grit chambers
Reason: A proportional weir (also known as a Sutro weir) is provided at the outlet of a rectangular grit chamber to maintain a constant horizontal flow velocity (0.3m/s) regardless of discharge variations.
Q. Muffle furnace - 4. Volatile solids
Reason: A muffle furnace is used in laboratories to ignite wastewater sludge samples at high temperatures ($550^\circ C$ to $600^\circ C$).The weight lost during ignition gives the amount of volatile (organic) solids.
R. Schmutzdecke - 2. Slow sand filters
Reason: A Schmutzdecke (or dirty layer) is a gelatinous biological film composed of algae, bacteria, and protozoa that forms on the top surface of a slow sand filter, acting as the primary layer for water purification.
S. Methaemoglobinemia - 1. Nitrate
Reason: Methaemoglobinemia (commonly known as **Blue Baby Disease**) is caused by high concentrations of nitrates (>45mg/l) in drinking water, which impairs oxygen transport in infants' blood.

59. Answer D
Solution
Tapered aeration is an aeration arrangement in an activated sludge process in which the rate of air supply is varied along the length of the aeration tank.
Oxygen demand is highest near the inlet because the incoming sewage contains a high concentration of organic matter.
As sewage flows through the tank, organic matter is progressively consumed.
Therefore, oxygen demand decreases towards the outlet.
Accordingly, the air supply is gradually reduced along the length of the tank.

60. Answer A
Solution
Plug flow and complete mix reactors related to the suspended growth activated sludge process.
The fluidized-bed reactor is an anaerobic reactor.

61. Answer C
Solution
Statement 1 (Correct): The pond relies on a symbiotic relationship between algae and bacteria. Algae produce oxygen through photosynthesis, which is used by bacteria to break down organic matter, while bacteria release carbon dioxide utilized by algae.
Statement 2 (Incorrect): The detention (retention) period for waste stabilization or oxidation ponds is typically much longer, generally ranging from 10 to 30 days (or 2 to 4 weeks), rather than 2 to 3 days.
Statement 3 (Correct): Dissolved oxygen in the pond is supplied by algae via photosynthesis.
Statement 4 (Incorrect): Waste stabilization ponds are predominantly facultative (containing both aerobic and anaerobic zones) or feature facultative/anaerobic bacteria, rather than strictly aerobic bacteria throughout.

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

62. Answer A

Solution

$$\gamma_d = \frac{\gamma_w (G)}{1+e}$$

$$1.6 = \frac{1 \times 2.68}{1+e}$$

e= 0.675

$$e = \frac{wG}{S_r}$$

For fully saturated condition Sr=100% (or) 1

$$0.675 = \frac{w \times 2.68}{1}$$

W= 0.2518 = 25.18%

63. Answer A

Solution

I_c	I_L	Consistency	Description
< 0	> 1	Liquid	Liquid
0 - 0.25	1 - 0.75	Plastic	Very soft
0.25 - 0.5	0.75 - 0.5		Soft
0.5 - 0.75	0.5 - 0.25		Medium stiff
0.75 - 1	0.25 - 0		Stiff
> 1	< 0	Semi-solid	Very stiff to hard
> 1	< 0	Solid	Hard to very hard

$$I_C = \frac{W_L - W}{I_P} \text{ and } I_L = \frac{W - W_P}{I_P}$$

Where

w is natural water content

W_L is liquid limit

W_p is plastic limit

I_P is plasticity index

Activity number	Classification
0.75	Inactive
0.75 – 1.25	Normal
> 1.25	Active

If A_C = 1.58 > 1.25

So soil is active

Plasticity Index	Plasticity
<7	Low
7 – 17	Medium
>17	Highly

So soil is high plastic

64. Answer A

Solution

Seepage velocity, $V_S = \frac{V}{n}$

$$n = \frac{e}{1+e} = \frac{1}{1+1} = 0.5$$

$$\Rightarrow V_s = \frac{0.01}{0.5} = 0.02\,\text{cm/sec}$$

65. Answer A

Solution

Due to a 2 m rise in water level, both the total stress and pore water pressure increase by the same amount. So,

$$\Delta\sigma^1 = \Delta\sigma - \Delta_u = 0$$

66. Answer B

Solution

Seepage force is due to frictional drag and its magnitude is given by $i\gamma_w$ per unit volume of soil.

For quick condition during upward flow.

Effective stress is zero

So statement 1 and 3 is correct.

67. Answer B

Solution

$$H_0 \propto 1 + e_0$$

$$\frac{H_1}{H_2} = \frac{1+e_1}{1+e_2}$$

$$\frac{H_1}{H_2} = \frac{1+1}{1+0.5}$$

$$\Rightarrow H_1 = 1.333 H_2$$

$$\therefore H_2 = \frac{2.4}{1.33} = 1.8\,\text{cm}$$

68. Answer B

Solution

For design $q_s \le q_{ns}$

(or) $q \le q_s$

$$q = \frac{\text{load}}{\text{Area}}$$

Load = 800+0.1 × 800

= 880 kN (Including self weight)

$$\frac{880}{B^2} = 300\text{kN/m}^2$$

$$B^2 = \frac{800}{300}$$

$$B^2 = 2.93\,\text{m}^2$$

$$\therefore B = 1.71\text{m}$$

Area = 1.71 × 1.71

= 1.75 × 1.75 (approximately)

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

69. Answer A

Solution

Compensating errors are proportional to the square root of the length of line. Theory of error is applicable to compensating errors.

70. Answer A

Solution

$$\text{Shrinkage factor} = \frac{\text{Shrunk length}}{\text{Actual length}}$$

$$= \frac{9.7}{10} = 0.97$$

$$\text{Corrected length} = \frac{\text{Measured length}}{\text{Shrinkage factor}}$$

$$= \frac{10}{0.97} = 10.3092\,\text{cm}$$

Scale 1 : 250

Actual length = 10.3092 × 250

= 2577.319 cm

= 25.773 m

71. Answer A

Solution

Kala Bhara Dungar is a hill located to the east of the Luni Basin, forming its eastern boundary.

काला भरा डूँगर, लूनी बेसिन की के पूर्व में स्थित पहाड़ी है जो पूर्वी सीमा बनाती है।

72. Answer A

Solution

- Greatest annual temperature range – Churu
- Greatest daily temperature range – Jaisalmer
- Most frequent dust storms – Ganganagar
- Most frequent heatwaves (loo) – Barmer
- Most frequent whirlwinds (bhabhulya) – Bikaner
- Hottest district – Churu
- Hottest place – Phalodi
- सर्वाधिक वार्षिक तापान्तर – चुरू
- सर्वाधिक दैनिक तापान्तर – जैसलमेर
- सर्वाधिक आँधिया – गंगानगर
- सर्वाधिक लू – बाड़मेर
- सर्वाधिक भभूल्या – बीकानेर
- सर्वाधिक गर्म जिला – चुरू
- सर्वाधिक गर्म स्थान - फलौदी

73. Answer A

Solution

Red Loamy Soil

This soil is formed from ancient crystalline and metamorphic rocks. Due to its red color and fine-textured particles, it is referred to as red loamy soil (or, in some contexts, laterite soil). This soil is deficient in phosphorus, nitrogen, humus, and calcium salts; it appears red due to a high concentration of iron oxide particles. It is found in parts of the Dungarpur, Banswara, Udaipur, Salumbar, and Chittorgarh districts in southern Rajasthan.

लाल दुमट मिट्टी

इस मृदा का निर्माण प्राचीन क्रिस्टलीय तथा कायान्तरित चट्टानों से हुआ है। लाल रंग युक्त इस मिट्टी के कण बारीक होने के कारण ही इसे लाल दुमट मिट्टी / लैटेराइट मिट्टी कहा जाता है। इस मिट्टी में फॉस्फोरस, नाइट्रोजन, ह्यूमस और कैल्सियम लवणों की कमी पायी जाती है तथा लौह ऑक्साइड के कणों की अधिकता के कारण लाल रंग की दिखाई देती है। यह मिट्टी दक्षिणी राजस्थान के डूंगरपुर, बाँसवाड़ा, उदयपुर, सलूम्बर और चित्तौड़गढ़ जिलों के कुछ भागों में पायी जाती है।

74. Answer C

Solution

Rajasthan ranks 15th in the country in terms of recorded forests.

अभिलेखित वनों में देश में राजस्थान का स्थान 15वाँ है।

75. Answer B

Solution

Ranakhara Conservation Reserve is located in Jalore.

रणखार कंजर्वेशन रिजर्व जालौर में स्थित है।

76. Answer B

Solution

Released the new edition of 'Desertification and Land Degradation Atlas' on World Day to Combat Desertification on June 17, 2021. It is published by Space Application Center based in Ahmedabad. In the year 2018-19, 62.06 percent of the total geographical area of Rajasthan is undergoing desertification and land degradation. According to the year 2018-19, wind erosion in Rajasthan is – 43.37%, vegetation erosion – 7.64%, water erosion – 6.21%.

17 जून, 2021 को विश्व मरुस्थलीकरण रोकथाम दिवस पर 'मरुस्थलीकरण एवं भूमि क्षरण एटलस' का नवीन संस्करण जारी किया। इसे अहमदाबाद स्थित स्पेस एप्लीकेशन सेंटर प्रकाशित करता है। वर्ष 2018-19 में राजस्थान के कुल भौगोलिक क्षेत्र का 62.06 प्रतिशत भाग मरुस्थलीकरण एवं भूमि क्षरण से गुजर रहा है। वर्ष 2018-19 के अनुसार राजस्थान में पवन क्षरण - 43.37 %, वनस्पति क्षरण - 7.64 %, जल कटाव - 6.21 % है।

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

77. Answer A

Solution

Statement 1: Line of collimation not perpendicular to the horizontal axis (collimation error). When the telescope is inverted, this error shifts the line of sight by an equal and opposite amount, which cancels out when you average both face readings.

Statement 2: Horizontal axis (trunnion axis) not perpendicular to the vertical axis. This causes the telescope to trace an inclined plane instead of a vertical plane. Changing the face shifts the inclination to the opposite side, completely eliminating the error upon taking the mean.

Statement 3: Line of collimation not parallel to the axis of the altitude level. This alters vertical angles and impacts leveling work. Just like the other structural geometry errors, it is neutralized by taking the mean of normal and inverted telescope face observations.

78. Answer A

Solution

for the design of vertical curves on roads Rider comfort, Headlight sight distance, Drainage criteria are used.

79. Answer C

Solution

S= 10 m

F = 0.35

a = f.g

a = 0.35 × 9.81

= 3.433 m/sec^2

$V^2 - u^2 = 2as$

$V^2 = 2 \times 3.433 \times 10$

V= 8.287 m/s

V= 29.83 kmph

80. Answer C

Solution

No. of lane = 2

Wheel base l = 6 m

R = 200 m

Mechanical widening $W_m = \frac{n\ell^2}{2R}$

$= = \frac{2 \times 6^2}{2 \times 200} = 0.18\,m$

Mechanical widening W_m= 0.18 m

81. Answer B

Solution

As part of the 'Rajasthan Greening and Rewilding Mission'—an initiative aimed at transforming Rajasthan into a greener state—a new scheme titled 'Tree Outside Forest in Rajasthan' (TOFIR) is being implemented for the year 2023-24. The objective of this scheme is to expand tree cover and increase greenery in areas located outside of designated forest zones. Under this initiative, a target has been set to plant 50 million (5 crore) saplings annually across the state, with the collaboration of various government departments, organizations, and citizens. Of these, 10 million (1 crore) saplings are earmarked for gochar (grazing lands), oran (sacred groves), and other pasture lands; 10 million (1 crore) for various urban areas; and 30 million (3 crore) will be made available to the general public through Forest Department nurseries for planting at their homes, on their farms, and in other such locations.

राजस्थान को हरित प्रदेश बनाने की दिशा में राजस्थान ग्रीनिंग एण्ड रीवाइल्डिंग मिशन के तहत वनस्पति आवरण को बढ़ाने और वन क्षेत्रों के बाहर हरियाली बढ़ाने के लिए वर्ष 2023-24 में ट्री आउटसाइड फॉरेस्ट इन राजस्थान (Tree Outside Forest in Rajasthan - TOFIR) नाम से नवीन योजना संचालित की जा रही है, जिसका उद्देश्य राजस्थान में पारंपरिक वनों के बाहर वृक्षों के कवरेज को विस्तारित करना और वन क्षेत्रों के बाहर हरियाली बढ़ाना है। इसके तहत प्रदेश में विभिन्न विभागों, संस्थाओं और नागरिकों के सहयोग से प्रतिवर्ष 5 करोड़ पौधे लगाने का लक्ष्य रखा गया है। इनमें से 1 करोड़ पौधे गोचर, ओरण तथा चारागाह, 1 करोड़ पौधे विभिन्न शहरी क्षेत्रों में तथा 3 करोड़ पौधे जन साधारण को अपने घरों, खेतों इत्यादि में लगाने के लिए वन विभाग की नर्सरियों से आमजन को उपलब्ध कराये जायेंगे।

82. Answer D

Solution

All options are correct.

सभी विकल्प सही है।

83. Answer D

Solution

Animals showing an increase – cows, buffaloes, sheep

Animals showing a decrease – goats, horses and ponies, donkeys, camels, pigs

वृद्धि वाले पशु - गाय, भैंस, भेड़

कमी वाले पशु - बकरी, घोड़े एवं टट्टू, गधे, ऊँट, सूअर

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

84. Answer D

Solution

In Rajasthan, minor irrigation projects make the largest contribution to irrigation.

Rajasthan's first multipurpose project – Gang Canal

Renuka Project – on the Giri River

राजस्थान में सिंचाई में सर्वाधिक योगदान लघु सिंचाई परियोजनाओं का होता है।

राजस्थान की प्रथम बहुउद्देशीय परियोजना – गंगनहर

रेणुका परियोजना - गिरी नदी पर

85. Answer B

Solution

Rajsamand is the district with the least irrigation (in terms of area).

न्यूनतम सिंचाई (क्षेत्रफल के आधार पर) वाला जिला राजसमन्द है।

86. Answer D

Solution

P. Incorrect : The 30th highest hourly traffic volume (DHV) is used for the design of highway facilities, not for determining safe speed limits.

Q. Correct : For a two-lane one-way road, the length of a summit curve is based on non-passing sight distance (Stopping Sight Distance) because overtaking sight distance is not required.

R. Correct : The maximum traffic volume that a road can accommodate under prevailing roadway and traffic conditions is called the capacity of the road.

S. Correct : In rigid pavements, frictional stresses are:

Summer: Compressive stress due to expansion.

Winter: Tensile stress due to contraction.

87. Answer C

Solution

Ultimate load = Load factor × Service load

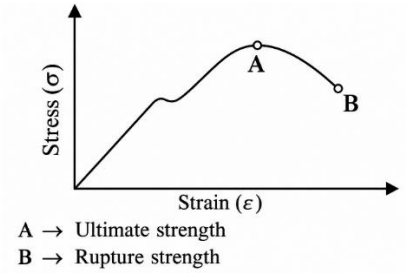
= 1.5 × 2000 = 3000 kN

Minimum area of longitudinal R/F = 0.8%

$$= \frac{0.8}{100} \times 500 \times 500 = 2000\,\text{mm}^2$$

88. Answer A

Solution



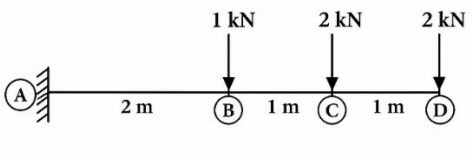
A → Ultimate strength

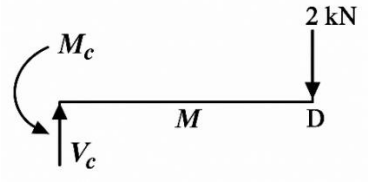
B → Rupture strength

89. Answer D

Solution

Given



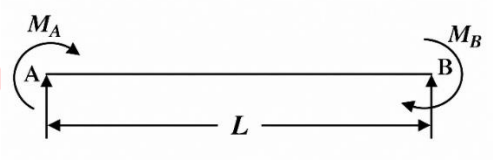


MC= 2 × 1

= 2 kNm (Hogging)

90. Answer C

Solution



From principal of superposition taking effect of each moment separately

At A M_A will cause rotation in clockwise direction and M_B will cause rotation in anti-clockwise direction

$$\theta_A = \frac{M_A L}{3EI} - \frac{M_B L}{6EI}$$

Similarly, $\theta_B = \frac{M_B L}{3EI} - \frac{M_A L}{6EI}$

Given $\frac{\theta_A}{\theta_B} = 2$

$$\frac{\frac{M_A}{3} - \frac{M_B}{6}}{\frac{M_B}{3} - \frac{M_A}{6}} = 2$$

$$\frac{2M_A - M_B}{2M_B - M_A} = 2$$

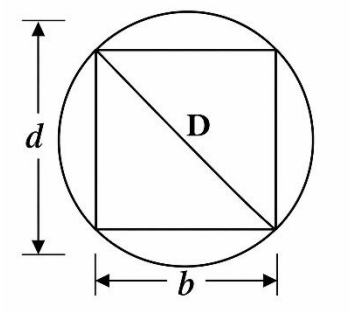
$$2M_A - M_B = 4M_B - 2M_A$$

$$4M_A = 5M_B$$

$$\frac{M_A}{M_B} = \frac{5}{4}$$

91. Answer B

Solution



From figure, $b^2 + d^2 = D^2$ .... (i)

$M = \sigma_Z$

For the beam to be strongest in bending, section modulus should be maximum.

Section modulus for rectangular beam

$$Z = \frac{bd^2}{6}$$

$$Z = \frac{b\left(D^2 - b^2\right)}{6} = \frac{1}{6}\left(D^2 b - b^3\right)$$

$$\frac{dZ}{db} = \frac{1}{6}\left(D^2 - 3b^2\right)$$

From Z to be maximum,

$$\frac{dz}{db} = 0$$

$$0 = \frac{1}{6}\left(D^2 - 3b^2\right)$$

$$b = \frac{D}{\sqrt{3}}$$

From equation (i)

$b^2 + d^2 = D^2$

$$\frac{D^2}{3} + d^2 = D^2$$

$$d^2 = \frac{2}{3}D^2$$

$$d = D\sqrt{\frac{2}{3}}$$

92. Answer A

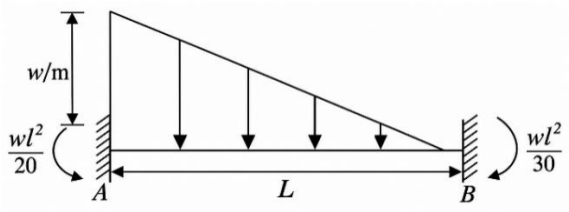
Solution

For same weight strength of hollow circular shaft is greater than that of solid circular shaft the weight of hollow shaft will be less in hollow shaft most part of the material is away from the centre and shear stress increases as distance from centre increases. Hence, material strength is properly utilised.

93. Answer B

Solution

Fixed end moment for beam loaded with uniformly varying load.



94. Answer C

Solution

Following principles are observed in design of connections.

1. The centre of gravity of bolts should coincide with centre of gravity of connected members.
2. The length of connection should be kept as small as possible.

95. Answer B

Solution

Angle of lacing with built – up column, should be $40° < \theta < 70°$

96. Answer B

Solution

Types of failure occur in the beam column connection are:

1. Failure by instability in plane of bending without twisting.
2. Failure by instability in one of the principal direction.
3. Failure by lateral torsional buckling.
4. Failure by combined twisting and bending on these torsionally weak sections.
5. Failure by combined twisting and bending when plane of bending does not contain shear centre.

Hence, statement-2 is wrong.

ZONE TECH
Best Institute For Assistant & Junior Engineer

97. Answer B
Solution
Vertical stiffeners are to be provided when
$$85 < \frac{d}{t_w} < 200$$
Max. and min. distance between vertical stiffeners is 1.5 d and 0.33 d.
These can be fitted between flanges with clear gaps at top and bottom.

98. Answer C
Solution
Modification factors to modify the wind speed taking in account the effect of terrain, topography and risk level.
$V_Z=V_b\ K_1, K_2, K_3$
V_z = design wind speed at any height Z in m/s.
K_1 = Probability factor (risk coefficient)
K_2 = Terrain, height and structure size factor
K_3 = topography factor.

99. Answer C
Solution
For sea water, grade of concrete lower than M30 shall not be used in reinforced concrete. (As per IS 456 : 2000).

100. Answer C
Solution
As per IS:456-2000, clause no. 15.4, the test results of the sample shall be the average of the strength of three specimens. The individual variation should not be more than ±15% of the average.

101. Answer C
Solution
'Diggi'- Campaign to restore surplus water for crops and agricultural activities in canal command area
'डिग्गी'- नहर कमान क्षेत्र में फसलों और कृषि गतिविधियों के लिए अधिशेष जल बहाल करने का अभियान

102. Answer D
Solution
National Highway No. 12 (new No. 52), length: 793.55 km. This highway passes through Churu, Sikar, Jaipur, Tonk, Bhilwara, Bundi, Kota, and Jhalawar.
राजमार्ग संख्या 12 (नया नं. 52), लम्बाई : 793.55 किमी.। यह राजमार्ग चुरू, सीकर, जयपुर, टोंक, भीलवाड़ा, बूँदी, कोटा, झालावाड़ में से गुजरता है।

103. Answer C
Solution

Pyrite/ पाइराइट	-	Saladipura / सलादीपुरा
Barytes/ बैराइट्स	-	Balupura/ बालूपुरा
Tamra/ तामड़ा	-	Janakpura/ जनकपुरा
Panna/ पन्ना	-	Kala Guman/ काला गुमान

104. Answer D
Solution
The Speaker of the Legislative Assembly serves as the ex-officio chairperson of the Business Advisory Committee, the General Purposes Committee, and the Rules Committee, but not of the Committee on Petitions or the Committee on Privileges.
विधानसभा अध्यक्ष कार्य मंत्रणा समिति, सामान्य उद्देश्य समिति व नियम समिति के पदेन अध्यक्ष के रूप में कार्य करता है न कि याचिका व विशेषाधिकार समिति के अध्यक्ष के रूप में।

105. Answer C
Solution
The Rajasthan State Human Rights Commission is a statutory commission. It became operational in March 2000 under the Protection of Human Rights Act, 1993. Therefore, it derives its powers from a legislative act, rather than from an executive order.
राजस्थान राज्य मानवाधिकार आयोग एक वैधानिक आयोग है। इसे मानव अधिकार संरक्षण अधिनियम, 1993 के तहत मार्च, 2000 में कार्यरत किया गया। इसलिए इसे एक विधायी अधिनियम से अपनी शक्तियाँ प्राप्त होती है न कि किसी कार्यकारी आदेश से

106. Answer B
Solution
Rs. 250 per day up to maximum Rs. 5000
प्रतिदिन 250 रु. से अधिकतम 5000 रु.

107. Answer B
Solution
Duties of the Sarpanch include convening and presiding over meetings of the Gram Sabha, safeguarding the records of the Gram Panchayat, and exercising administrative supervision and control over the staff of the Gram Panchayat. Additionally, the Sarpanch is responsible for providing reports and records to the State Government as and when required. It is noteworthy that the Sarpanch serves as the chairperson of the Gram Panchayat Planning and Coordination Committee, and also acts as the ex-officio chairperson of the Gram Panchayat's standing committee constituted for administration and institutional matters.
सरपंच के कर्तव्य - ग्राम सभा की बैठक बुलाना एवं अध्यक्षता करना। ग्राम पंचायत के अभिलेखों की रक्षा करना। ग्राम पंचायत के कर्मचारियों पर प्रशासनिक पर्यवेक्षण एवं नियंत्रण रखना। समय-समय पर राज्य सरकार को प्रतिवेदन एवं अभिलेख उपलब्ध करवाना। उल्लेखनीय है कि सरपंच ग्राम पंचायत नियोजन एवं समन्वय समिति का अध्यक्ष तथा प्रशासन और संस्थान के लिए गठित ग्राम पंचायत की स्थायी समिति का पदेन अध्यक्ष होता है।

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

108. Answer A

Solution

Under Section 44 (Determination of the validity of the election of a Chairperson or Vice-Chairperson), "provided that when an election petition is presented to a District Judge in the manner aforesaid, he may, for reasons to be recorded in writing, transfer it to a subordinate judge for hearing and disposal."

धारा 44 (अध्यक्ष या उपाध्यक्ष के निर्वाचन की विधिमान्यता के अवधारणा) के अन्तर्गत "परन्तु जब किसी जिला न्यायाधीश को यथा-पूर्वोक्त रूप से कोई निर्वाचन याचिका प्रस्तुत की जाये, तब वह उसे लेखबद्ध कारणों से अधीनस्थ किसी न्यायाधीश को सुनवाई तथा निपटारे के लिए अन्तरित कर सकेगा।"

109. Answer C

Solution

Rajasthan Information Commission Chairman-

First: M.D. Kaurani - April 18, 2006 (Most)

Second: T. Srinivasan - 05 September, 2011

Third: Suresh Kumar Chaudhary - 25 December, 2018

Fourth: Devendra Bhushan Gupta - 11 December 2020 (minimum)

Fifth: Mohan Lal Lather - Continuous from 09 July 2024

राजस्थान सूचना आयोग अध्यक्ष-

प्रथम : एम.डी. कौरानी - 18 अप्रैल, 2006 (सर्वाधिक)

द्वितीय : टी. श्रीनिवासन - 05 सितम्बर, 2011

तृतीय : सुरेश कुमार चौधरी - 25 दिसम्बर, 2018

चतुर्थ : देवेन्द्र भूषण गुप्ता - 11 दिसम्बर 2020 (न्यूनतम)

पंचम : मोहन लाल लाठर - 09 जुलाई 2024 से निरन्तर

110. Answer B

Solution

The State Election Commission, Rajasthan, is a single-member commission that functions under the leadership of the State Election Commissioner.

The State Election Commissioner is not eligible for reappointment.

राज्य निर्वाचन आयोग, राजस्थान एकल सदस्यीय आयोग है जो राज्य निर्वाचन आयुक्त के नेतृत्व में कार्य करता है।

राज्य निर्वाचन आयुक्त पुनर्नियुक्त नहीं होता है।

111. Answer A

Solution

Simply supported beam of span = 20.0 m

According to code IS : 456 - Clause (23.2.1) for limiting deflection

Basic value of $\frac{\text{span}}{\text{depth}}$ =20 (upto span 10 m)

The above value will be multiplied by $\frac{10}{\text{depth}}$ in case span > 10, further the value will be modified by multiplying with the modification factors for tension and compression reinforcement.

$\frac{\text{span}}{\text{depth}}$ ratio = 20 × $\frac{10}{\text{span}}$ x (modification factor) × (modification factor)$_2$

$= = 20 \times \frac{10}{20} \times 0.9 \times 1.1 = 9.9$

The minimum effective depth = $\frac{\text{span}}{9.9}$

$= \frac{20}{9.9} = 2.02\,\text{m}$

112. Answer D

Solution

$\sigma_0 = 1000\,\text{N/mm}^2$

$\Delta l = 2\,\text{mm}$

$l = 25\,\text{m}$

Loss of prestress due to

Anchorage slip = $\frac{\Delta l}{l} \times \varepsilon_s$

$= \frac{2}{25 \times 10^3} \times 200 \times 10^3 = 16\,\text{N/mm}^2$

$\%\,\text{loss} = \frac{16}{1000} \times 100 = 1.6\%$

113. Answer A

Solution

High Alumina cement has very high early compressive strength and has high heat of hydration in comparison to OPC - 43 grade.

High Alumina cement is preferred for use in cold region due to high heat of hydration.

F-26/A Madhuvan Colony, Kisan Marg, Tonk Phatak, Jaipur Call Us : 9462447676, 9828747676

114. Answer D
Solution
To determine the workability of concrete we have to use slump test, Vee-Bee test, compaction factor test and flow table test.

115. Answer A
Solution
Burnt clay paving bricks -IS3583
Burnt clay soiling bricks -IS5779
Burnt clay hollow bricks - IS3952
Burnt clay perforated bricks -IS2222

116. Answer D
Solution
Fibre saturation point is the moisture content at which all of the free water is removed, the cell cavities are empty but the cell walls are still completely saturated. Any drying below the fibre saturation point results in shrinkage, sudden and fast drying of timber results in the removal of water from cell walls and the consequent shrinkage causes cracking.

117. Answer C
Solution
In AutoCAD, typing REC (or RECTANG) and pressing Enter or Spacebar activates the rectangle command.
Here is what happens with the other options:
R: This is the shortcut alias for the REDRAW command, which refreshes the current viewport screen display.
RE: This is the shortcut alias for the REGEN (Regenerate) command, which regenerates the entire drawing from the drawing database to fix pixelated circles or curves.
RET: This is not a valid standard AutoCAD shortcut command.

118. Answer B
Solution
In AutoCAD, the shortcut alias for drawing a Polyline (a continuous sequence of connected line or arc segments created as a single object) is PL.
Here is what the other shortcut options do in AutoCAD:
P: Activates the PAN command, which allows you to drag the drawing view around the screen.
PO: Activates the POINT command, which creates a single coordinate point object in your drawing space.
PLE: This is not a standard shortcut alias in AutoCAD.

119. Answer B
Solution
Days crashed = 10 - 8 = 2 days
Extra cost = cost slope x days crashed = 75 x 2 = 150
Crash cost = normal cost + extra cost
Crash cost = 350 + 150 = Rs 500

120. Answer B
Solution
Fulkerson's rule is used for numbering events in a network.
Start with the initial event as 1, then number events that have no unnumbered predecessor in increasing order.
This ensures the tail event number is always smaller than the head event number.
Bowditch's rule is used in traverse (surveying) adjustment.

ZONE TECH Best Institute For Assistant & Junior Engineer