પ્રશ્નપુસ્તિકા ક્રમાંક

M

સમય :120 મિનિટ	Time : 120 Minutes
કુલ પ્રશ્નો : 200	Total Ques. : 200
કુલ ગુણ : 200	Total Marks : 200

This Question Booklet Contains 48 Printed Pages

ઉમેદવારનો Roll બેઠક નંબર No:

BVM

ઉમેદવારોને સૂચના

સૂચના ન મળે ત્યાં સુધી પ્રશ્નપુસ્તિકા ખોલવી નહીં

(1) પ્રત્યેક પ્રશ્નનો ઉત્તર A, B, C અને D પૈકી કોઈ એક છે અને ઉમેદવાર જો જવાબ ન આપવા માંગતા હોય તો તેમના માટે વિકલ્પ E OMR ઉત્તરપત્રમાં આપેલ છે. તમારે બધાજ પ્રશ્નોના ઉત્તર આપવા ફરજીયાત છે. તમારે આ સાથે **અલગ** OMR **ઉત્તરપત્રમાં જ ઉત્તર આપવાના છે.**

ઉદાહરણ તરીકે:

ભારતના રાષ્ટ્રપિતા તરીકે કોણ ઓળખાય છે?

(A) સરદાર પટેલ (B) સુભાષચંદ્ર બોઝ

(C) મહાત્મા ગાંધી (D) વિનોબા ભાવે

ઉત્તરપત્ર (OMR SHEET) માં

(A) (B) ● (D) (E)

ઉપર્યુક્ત ઉદાહરણનો જવાબ "C" છે. આથી "C" નું વર્તુળ કાળું (encode) કરેલ છે. સાચી અને ખોટી પદ્ધતિથી વર્તુળ ઘાટું કરવા બાબતની સૂચના OMR ની પાછળ આપેલ છે જેની નોંધ લેવી

(2) આ પાના ઉપર આપનો રોલ નંબર લખો.

(3) બધા જ પ્રશ્નો પૂરેપૂરા છપાયેલા છે કે કેમ તેની પ્રથમ ખાતરી કરી લો. જો પ્રશ્નો પૂરા છપાયા ન હોય અથવા કોઈ પૃષ્ઠ ફાટેલું હોય કે કોઈ પૃષ્ઠ સામેલ ન હોય અથવા તો અન્ય કોઈ ક્ષતિ જણાય તો તરત જ પ્રશ્નપુસ્તિકા નિરીક્ષક પાસેથી અચૂક બદલાવી લેવી.

ઉમેદવારને OMR ઉત્તરપત્ર મળ્યા બાદ જો તેઓ દ્વારા તેનો નાશ કરવામાં આવશે કે ગુમ કરવામાં આવશે તો તે ઉમેદવાર ગેરલાયક ઠેરાવવામાં આવશે તેમજ ભવિષ્યની પરીક્ષાઓમાં બેસવા માટે પ્રતિબંધ મુકવા ઉપરાંત ફોજદારી ગુનાને પણ પાત્ર બનશે.

(4) પરીક્ષા શરૂ થયેથી પૂરી થાય તે દરમ્યાન ઉમેદવાર પરીક્ષાર્થીએ પરીક્ષાખંડ છોડવાની મનાઈ છે.

(5) ઉમેદવારે પોતાના બેઠક ક્રમાંકની પ્રશ્નપુસ્તિકા અને OMR ઉત્તરપત્ર મળેલ છે તેની ખાતરી કરી લેવી અન્યથા ખંડ નિરીક્ષકનું તરત જ ધ્યાન દોરવું. ઉમેદવારને OMR ઉત્તરપત્ર મળે કે તરત જ તેમાં નિયત કરેલ જગ્યાએ પોતાનો બેઠક નંબર સ્વચ્છ અક્ષરે લખવાનો રહેશે. તેમજ બેઠક ક્રમાંક નીચે આપેલ વર્તુળ પણ ઘાટું કરવાનું રહેશે. મળેલ પ્રશ્નપત્રની સીરીઝ નિયત જગ્યાએ લખીને તેની નીચે તે સીરીઝ સામે આપેલ વર્તુળ પણ ઘાટું કરવાનું રહેશે. લખેલી વિગતો અને ઘાટું કરેલ વર્તુળની વિગતો યોગ્ય રીતે ભરાયેલ છે તેની ખાતરી કરી લેવી.

(6) પ્રત્યેક સાચા જવાબદીઠ 1 (એક) ગુણ મળવાપાત્ર થશે. આયોગ દ્વારા ગુણાંકન પદ્ધતિમાં માઈનસ પદ્ધતિ દાખલ કરવામાં આવી છે. જે મુજબ-

(i) પ્રત્યેક ખોટા જવાબદીઠ, ખાલી છોડેલ જવાબદીઠ તથા છેકછાક, ખોટી પદ્ધતિથી એક કરતાં વધુ વિકલ્પ દર્શાવેલ જવાબદીઠ 0.3 ગુણ કાપવામાં આવશે. પરંતુ જો ઉમેદવાર જવાબ આપવા માંગતા ન હોય અને વિકલ્પ (E) ઘાટું કરશે તો 0.3 ગુણ કાપવામાં આવશે નહીં.

(ii) આન્સર કી ફાઈનલ કરતી વખતે જો આયોગ દ્વારા એક પ્રશ્નના એકથી વધુ વિકલ્પો સાચા છે તેમ જાહેર કરવામાં આવે ત્યારે સાચા વિકલ્પ પૈકી કોઈપણ જવાબ માટે એક (1) ગુણ મળવાપાત્ર થશે.

(7) OMR ઉત્તરપત્રમાં નિશ્ચિત જગ્યા સિવાય ઉમેદવારે પોતાનો બેઠક ક્રમાંક લખવો નહીં તથા પોતાની ઓળખ છતી થાય તેવી નામ સહિતની અન્ય કોઈ પણ પ્રકારની નિશાની કરવાની સખત મનાઈ છે. તેમ છતાં પણ કોઈ પણ નિશાની કે ઓળખ માલૂમ પડશે તો તેને સંપૂર્ણ ગેરશિસ્ત ગણવામાં આવશે અને પરીક્ષા માટે ગેરલાયક ગણવામાં આવશે.

(8) OMR ઉત્તરપત્રના પ્રમાણપત્રમાં ઉમેદવાર તથા નિરીક્ષક બંનેની વાદળી / કાળી બોલપોઈન્ટ પેનથી સહી તથા ઉમેદવારના ડાબા હાથના અંગુઠાનું નિશાન ફરજિયાત છે. ઉમેદવારની સહી તથા ડાબા હાથના અંગુઠાના નિશાન વિનાની OMR ઉત્તરપત્રવાળા ઉમેદવાર ગેરલાયક ઠરશે.

(9) પરીક્ષા દરમ્યાન ઉમેદવાર પાસેથી કોઈ પણ સાહિત્ય, ગાઇડ, માર્ગદર્શિકા, કાપલી, સ્લીપો, અન્ય હસ્તલિખિત કે પ્રિન્ટેડ સાહિત્ય, મોબાઇલ ફોન, પેજર, કેલ્ક્યુલેટર કે અન્ય વીજાણુ ઉપકરણો હોવાનું જણાશે તો ઉમેદવારને ગેરલાયક ગણવામાં આવશે. તેમજ ભવિષ્યની પરીક્ષાઓમાં બેસવા માટે પ્રતિબંધ મુકવા પણ પગલાં લેવાશે.

(10) ચાલુ પરીક્ષા દરમ્યાન અંદરોઅંદર ગુસપુસ કરવી, અવાજ કરવો કે નિરીક્ષકની સૂચનાઓનું ઉલ્લંઘન કરવું તે ગેરશિસ્ત ગણાશે. કોઇ પણ પ્રકારની ગેરશિસ્ત બદલ પગલા લેવાશે.

(11) ઉમેદવારે વાદળી / કાળી બોલપોઈન્ટ પેનથી ઉત્તરો લખવાના છે. અન્ય શાહી કે પેન કે પેન્સિલ તથા સફેદ શાહીનો ઉપયોગ કરી શકશે નહીં તથા સફેદ શાહી (White Ink), બ્લેડ કે રબ્બરથી કે અન્ય કોઈ પણ રીતે કરેલા સુધારા માન્ય ગણાશે નહીં.

(12) આ જવાબવહી કમ્પ્યુટર દ્વારા તપાસવાની હોવાથી તે વળે, ફાટે કે બગડે નહીં તેની ખાસ કાળજી રાખવી તથા જવાબ વહીની ઘડી વાળવી નહીં.

(13) પ્રશ્નપુસ્તિકામાં કોરી જગ્યામાં રફકામ કરવું. તે માટે અલગ કાગળ આપવામાં આવશે નહીં. જવાબવહી માં કઈ પણ રફવર્ક કરવું નહીં. પ્રશ્નપુસ્તિકામાં જવાબો લખવાની મનાઈ છે. પરીક્ષાખંડ છોડતા પૂર્વે જવાબવહી (OMR Answer Sheet) નિરીક્ષકને સોંપવી, જ્યારે પ્રશ્નપુસ્તિકા ઉમેદવારો લઈ જઈ શકશે.

પરીક્ષા પૂરી થયા બાદ OMR ઉત્તરપત્ર વર્ગ નિરીક્ષકને સોંપ્યા બાદ જ વર્ગખંડ છોડવાનો રહેશે. તેમ કરવામાં કસૂર થયેથી ઉમેદવારને ગેરલાયક ઠેરવવામાં આવશે. તે ભવિષ્યની પરીક્ષાઓમાં બેસવા માટે પ્રતિબંધ મૂકવા તથા ફોજદારી પગલા લેવાને પણ પાત્ર થશે.

M

1. **Fiber Reinforced Polymer (FRP) is increasingly used in Civil Engineering primarily because of its**

   (A) Low cost compared to structural steel.

   (B) High strength-to-weight ratio and excellent corrosion resistance.

   (C) Ability to be easily welded on-site.

   (D) High melting point compared to ceramic materials.

2. **The relationship between Young's Modulus (E), Modulus of Rigidity (G) and Poisson's ratio (μ) is given by the expression**

   (A) $E = 2G(1 + \mu)$ **(B) $E = 3G(1 - 2\mu)$**

   (C) $G = 2E(1 + \mu)$ **(D) $G = 3E(1 - 2\mu)$**

3. **A structure is considered Statically Indeterminate when**

   (A) The number of unknown reaction components exceeds the number of available equilibrium equations.

   (B) The structure is capable of moving as a rigid body under any load system.

   (C) The equations of statics are sufficient to determine all internal forces and reactions.

   (D) The degrees of freedom (DOF) represent the number of independent variables required to describe the displacement.

4. **Which of the following is NOT a requirement for a Plastic Hinge to form in a steel structure?**

   (A) The material must be sufficiently ductile.

   (B) The section must be "Compact" or "Plastic" to prevent local buckling.

   (C) The entire cross-section must reach the yield stress.

   (D) The structure must be statically determinate.

5. **Consider the following statements regarding the Limit State of Serviceability**

   1. It ensures that the structure does not collapse under the design loads.

   2. It includes checks for excessive deflection and cracking to ensure user comfort and durability.

   3. Partial safety factors for loads in serviceability checks are generally taken as 1.0.

   Which of the statements given above are correct?

   (A) 1 and 2 only **(B) 2 and 3 only**

   (C) 1 and 3 only **(D) 1, 2 and 3**

6. In network analysis, the Critical Path of a project is defined as

(A) The path with the maximum number of activities.

(B) The shortest path through the network diagram.

(C) The longest continuous sequence of activities that determines the minimum project duration.

(D) The path that contains activities with the highest total float.

7. An Approximate Estimate is prepared primarily to

(A) Determine the exact quantity of reinforcement required in the slabs.

(B) Decide the financial feasibility and obtain administrative approval for a project.

(C) Finalize the contract agreement with the successful bidder.

(D) Calculate the actual profit earned by the contractor after completion.

8. Consider the following statements regarding Cavity Walls

1. The primary purpose of a cavity wall is to prevent dampness from the outer face reaching the inner face.
2. The cavity provides better thermal insulation compared to a solid wall of the same thickness.
3. The width of the cavity is usually kept between 10 *mm* and 20 *mm*.

Which of the statements given above are correct?

(A) 1 and 2 only (B) 2 and 3 only

(C) 1 and 3 only (D) 1, 2 and 3

9. Which of the following statements regarding the "Viscosity" of fluids are correct?

1. The dynamic viscosity of liquids decreases with an increase in temperature.
2. The dynamic viscosity of gases increases with an increase in temperature.
3. For a Newtonian fluid, the shear stress is directly proportional to the rate of shear strain.

(A) 1 and 2 only (B) 2 and 3 only

(C) 1 and 3 only (D) 1, 2 and 3

10. Consider the following statements:

1. Uneven distribution of heat on the earth surface is due to the Coriolis Effect.
2. Rain or snow that evaporates before reaching the earth surface while falling through the atmosphere is known as Virga.
3. A tropical cyclone in Northern Hemisphere is a wind speed with low pressure zone of anticlockwise rotation.
4. Water freezes on contact with cold ground is called Sleet.

Which of the statements given above is/are correct?

(A) 1, 2 and 3
(B) 2 only
(C) 2 and 3 only
(D) All of the above

11. Consider the following statements regarding water distribution systems

1. A gridiron distribution network provides multiple flow paths between supply and demand nodes.
2. Dead-end distribution systems are generally more suitable for large urban areas than gridiron systems.

Choose the correct option:

(A) 1 only
(B) 2 only
(C) Both 1 and 2
(D) None of the above

12. Consider the following statements regarding consolidation of soils

1. Consolidation is a time-dependent process involving the expulsion of pore water from saturated cohesive soils.
2. The Coefficient of Consolidation (C_v) is used to calculate the rate of settlement.
3. Primary consolidation is caused by the expulsion of air from the soil voids.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

[Contd.

13. Which of the following is NOT a characteristic of the Global Positioning System (GPS)?

(A) The Multipath Error occurs when the signal reaches the receiver's antenna via multiple paths.

(B) GPS uses the WGS84 ellipsoid as its coordinate reference system.

(C) A minimum of three satellites is sufficient to determine a highly accurate 3D position and receiver clock offset.

(D) Dilution of Precision (DOP) is a measure of the geometric strength of the satellite.

14. Consider the following statements regarding road alignment

1. Obligatory points are those through which the alignment must pass or must not pass.
2. A straight alignment is always the most economical, regardless of the terrain or intermediate towns.

Which of the statements given above is/are correct?

(A) 1 only

(B) 2 only

(C) Both 1 and 2

(D) Neither 1 nor 2

15. Regarding Bogue's compounds in portland cement, which of the following statements is correct regarding their contribution to strength and heat of hydration?

1. C_3S hydrates more rapidly than C_2S and is responsible for the "initial" set and early strength within the first 7 days.
2. C_3A reacts instantaneously with water, contributing the highest heat of hydration but providing the least long-term structural strength.
3. C_4AF is primarily responsible for the resistance of cement against sulfate attack.

Which of the statements given above are correct?

(A) 1 and 2 only

(B) 2 and 3 only

(C) 1 and 3 only

(D) 1, 2 and 3

16. Consider the following statements regarding the Statue of Unity at Kevadia

1. It is the tallest statue in the world, standing at a height of 182 meters.
2. The structural system consists of two reinforced concrete (RCC) cores surrounded by a steel space frame.
3. The exterior is clad with over 12,000 bronze panels to withstand wind speeds of up to 180 km/h.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

17. Regarding the use of Recycled Concrete Aggregates (RCA) in road construction, which of the following is a primary technical challenge compared to natural aggregates?

(A) RCA typically has higher water absorption due to the presence of adhered mortar.
(B) RCA is significantly heavier than natural basalt aggregates.
(C) RCA cannot be compacted using standard vibratory rollers.
(D) RCA is chemically inert and does not bond with bitumen.

18. 3D Concrete Printing (3DCP) is gaining popularity in the construction industry primarily, because it

(A) Increases the need for expensive timber formwork.
(B) Allows for complex architectural geometries without the need for traditional molds.
(C) Uses only standard coarse aggregates (20mm) for the printing mix.
(D) Requires a significantly higher number of manual labourers on-site.

19. Which of the following is a primary advantage of using Precast and Prefabricating technology in construction?

(A) Elimination of the need for any quality control on site.
(B) Reduction in construction time and improved finish quality under factory-controlled conditions.
(C) Higher consumption of cement compared to cast-in-situ methods.
(D) Lower initial transportation costs for all project types.

20. Consider the following statements regarding Mohr's circle of stress

1. The coordinates of any point on the circumference represent the normal and shear stress on a specific plane.
2. The center of the Mohr's circle always lies on the normal stress (σ) axis.
3. The radius of the Mohr's circle represents the maximum principal stress.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

21. In the analysis of a pin-jointed plane truss, the Method of Joints is based on the premise that

(A) The entire truss is in equilibrium, but individual joints are not.
(B) Every joint in the truss is in equilibrium and the sum of horizontal and vertical forces at each joint must be zero.
(C) The internal members of the truss can resist bending moments and shear forces.
(D) The load is applied directly to the center of the members rather than the joints.

22. Assertion (A): High-strength friction grip (HSFG) bolts are preferred over bearing-type bolts in structures subjected to dynamic or reversal of loads.

Reason (R): HSFG bolts transfer the load through friction between the interface of the connected plates rather than through shear or bearing on the bolt shank.

Choose the correct answer:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(B) Both (A) and (R) are correct, but (R) is not the correct explanation of (A)
(C) (A) is correct but (R) is incorrect
(D) (A) is incorrect but (R) is correct

23. In a One-Way Slab, the main reinforcement is provided along

(A) The shorter span only.
(B) The longer span only.
(C) Both shorter and longer spans equally.
(D) The diagonal of the slab.

24. Consider the following statements regarding the Program Evaluation and Review Technique (PERT)

1. PERT is an event-oriented technique suitable for non-repetitive R&D projects.
2. It assumes a Beta distribution for the time estimates of activities.
3. The Expected Time (t_e) is calculated as ($t_o + 4t_m + t_p$) / 6.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

25. While preparing a Detailed Estimate, the dimensions are generally measured to the nearest

(A) 0.01 m
(B) 0.1 m
(C) 0.001 m
(D) 0.5 m

26. Reinforced Brickwork is used in construction primarily to

(A) Improve the fire resistance of the bricks.
(B) Enable the brick masonry to resist tensile and shear stresses.
(C) Make the wall completely transparent.
(D) Reduce the amount of mortar required by 50%.

27. In Fluid Kinematics, a Flow Net is a graphical representation used for the analysis of

(A) Turbulent flow in rough pipes.
(B) Two-dimensional, irrotational and incompressible flow.
(C) Flow of highly viscous fluids like heavy oil.
(D) Unsteady flow in surge tanks.

28. Consider the following statements about estimation of rainfall missing data

1. Normal Ratio method is applied when precipitation of selected station is within the 10% of that normal precipitation of missing data.
2. Arithmetic mean method is applied when the station's normal precipitation is outside the 10% of the missing station's normal precipitation.

Which of the statements given above is/are correct?

(A) 1 only
(B) 2 only
(C) Both 1 and 2
(D) Neither 1 nor 2

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29. Consider the following statements regarding water demand estimation

1. Per capita water demand varies with climatic conditions and living standards.
2. Fire demand generally constitutes a major portion of total annual water demand.
3. Leakage losses in distribution systems may significantly influence required supply capacity.

Which of the above statements are correct?

(A) 1 and 3 only
(B) 2 and 3 only
(C) 1 and 2 only
(D) 1, 2 and 3

30. Quick Sand condition occurs in a soil mass when

(A) The exit gradient becomes equal to the critical hydraulic gradient.
(B) The cohesion of the soil becomes infinite.
(C) The effective stress becomes equal to the total stress.
(D) The flow is downward with very high velocity.

31. When planning a waste disposal facility (Landfill) in urban areas using Geoinformatics, which dataset combination is most critical for environmental safety?

(A) Land use/Land cover + Population density + Traffic volume.
(B) Hydrogeology + Soil Permeability + Proximity to water bodies.
(C) Topography + Wind direction + Property tax zones.
(D) Vegetation index (NDVI) + Crop inventory + Rainfall frequency.

32. In the design of a horizontal curve, super-elevation is provided to

(A) Counteract the effect of centrifugal force.
(B) Prevent the vehicle from skidding or overturning.
(C) Allow higher speeds on the curve.
(D) All of the above

33. The Alkali-Aggregate Reaction (AAR) in concrete is a deleterious chemical process. Which of the following conditions is NOT a prerequisite for this reaction to occur?

(A) High alkali content in the cement.
(B) Presence of reactive silica or carbonates in the aggregate.
(C) A constant moisture level where relative humidity exceeds 80%.
(D) High concentrations of C_3A in the cement paste.

34. The Rani ki Vav (The Queen's Stepwell) in Patan is a world-renowned monument of Gujarat. From a civil engineering perspective, it is a unique example of

(A) Modern cantilever construction.

(B) Subterranean water management and multi-storeyed stone architecture.

(C) A timber-framed structure used for grain storage.

(D) An early example of a reinforced masonry dam.

35. In the context of Sustainable Road Construction, the use of Plastic Waste (bitumen-plastic mix) in the wearing course of flexible pavements helps to

1. Increase the softening point of the bitumen.

2. Improve the resistance of the pavement to water-induced stripping.

3. Reduce the amount of virgin bitumen required, thereby lowering costs.

Which of the statements given above are correct?

(A) 1 and 2 only (B) 2 and 3 only

(C) 1 and 3 only (D) 1, 2 and 3

36. Which of the following is a primary characteristic of "Self-Healing Concrete"?

(A) It contains encapsulated bacteria that produce limestone to seal cracks when moisture enters.

(B) It uses a high amount of plastic fibres to prevent any cracks.

(C) It is a type of concrete that never requires any reinforcement.

(D) It can only be used in underwater construction.

37. In Concrete Mix Design, the term "Bulking of Sand" refers to

(A) The increase in the volume of sand caused by a film of moisture around the particles.

(B) The addition of excess fine aggregates to fill the voids in coarse aggregates.

(C) The process of grading sand using a series of standard sieves.

(D) The chemical reaction between sand and the cement paste.

38. According to the Maximum Shear Stress Theory (Tresca's Theory), yielding occurs when the maximum shear stress in a material reaches

(A) The yield stress in axial tension.

(B) Half of the yield stress in axial tension.

(C) Twice the yield stress in axial tension.

(D) The ultimate tensile strength of the material.

39. Consider the following statements regarding Influence Line Diagrams (ILD)

1. An ILD represents the variation of a specific stress resultant (like reaction or bending moment) at a fixed section as a unit load moves across the span.
2. For a simply supported beam, the ILD for the bending moment at any section is always a triangle.
3. According to Müller-Breslau's principle, the ILD for any redundant force is the deflected shape of the structure.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

40. In the design of steel beams, Lateral Torsional Buckling can be prevented by

(A) Using a thinner web to reduce weight.
(B) Providing adequate lateral support to the compression flange.
(C) Increasing the span of the beam.
(D) Applying the load at the neutral axis.

41. Pre-stressed Concrete is often preferred over conventional RCC for long-span bridges because

(A) It allows for a smaller cross-section and lighter self-weight.
(B) It completely eliminates the need for high-strength steel.
(C) It is cheaper for small residential buildings.
(D) It does not require any specialized equipment for tensioning.

42. In Contract Management, Liquidated Damages are

(A) The total value of the work completed by the contractor.
(B) A pre-determined sum of money to be paid by the contractor to the client in the event of a delay in project completion.
(C) The costs associated with repairing structural defects after the project is handed over.
(D) Bonuses paid to the contractor for completing the work ahead of schedule.

43. Consider the following statements regarding the Plinth Area Estimate

1. It is an approximate estimate based on the external dimensions of the building at the floor level.
2. The area of the courtyard and open spaces is included in the plinth area calculation.
3. The plinth area rate is derived from the cost of similar buildings recently constructed in the locality.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

44. Regarding Formwork for concrete, which of the following represents the correct sequence for the removal of formwork?

(A) Beam sides → Slab soffit → Beam soffit → Walls/Columns
(B) Walls/Columns → Beam sides → Slab soffit → Beam soffit
(C) Beam soffit → Slab soffit → Beam sides → Walls/Columns
(D) Slab soffit → Walls/Columns → Beam sides → Beam soffit

45. A Hydraulic Jump occurs in an open channel when the flow changes from

(A) Supercritical to Subcritical
(B) Subcritical to Supercritical
(C) Steady to Unsteady
(D) Uniform to Non-uniform

46. Select the incorrect statement

(A) An Effluent stream is defined as a stream which receives some flow from the ground water discharge.
(B) Perennial stream does not have any base flow contribution. The stream dries up soon after the end of stream flow.
(C) River discharge can be estimated by measuring velocity and flow area across a section.
(D) Frequent sediment deposition in a channel generally reduces the reliability of the rating curve.

47. Consider the following requirements

1. Removing all the impurities
2. Tapping the water throughout the year
3. Getting water free from suspended and floating solid matter
4. Quantifying the water taken from the source

Which among the above mandate that intakes be provided in a water supply scheme?

(A) 1, 2 and 4 (B) 1 and 4 only

(C) 2 and 3 only (D) 2, 3 and 4

48. Negative Skin Friction in a pile foundation is likely to occur when

(A) The pile is driven into dense sand.

(B) The surrounding soil settles more than the pile itself.

(C) The pile is subjected to an upward pull.

(D) The water table is at the ground level.

49. Consider the following statements regarding the use of Geoinformatics in Civil Engineering

1. Vector data models are preferred for representing continuous phenomena like elevation or rainfall intensity.
2. Raster data models are more efficient for network analysis in transportation studies.
3. In a GIS environment, "Intersect" and "Union" are spatial overlay operations used to identify areas meeting specific multi-criteria conditions.

Which of the above statements is/are correct?

(A) 1 and 2 only (B) 3 only

(C) 2 and 3 only (D) 1, 2 and 3

50. Flexible pavements distribute the wheel load to the lower layers primarily through

(A) Flexural strength of the slab.

(B) Grain-to-grain contact (interlayer friction).

(C) Tensile strength of the bitumen.

(D) Concrete beam action.

51. In Concrete Mix Design, the Target Mean Strength $f_{ck'}$ is calculated as $f_{ck} + 1.65\sigma$. The factor 1.65 ensures that

(A) At least 95% of the test results fall below the characteristic strength.

(B) Not more than 5% of the test results are expected to fall below the characteristic strength.

(C) The average strength is always double the characteristic strength.

(D) The standard deviation is always treated as zero.

52. Which major reservoir in Gujarat is known for having the Largest Gross Storage Capacity entirely within the state's geographical borders?

(A) Ukai Dam (Vallabh Sagar) (B) Dharoi Dam

(C) Kadana Dam (D) Panam Dam

53. The Safe System Approach in road safety engineering is based on the principle that

(A) Humans are infallible and will never make mistakes while driving.

(B) The road system should be designed to account for human error and limit impact forces to the level human body can tolerate.

(C) Pedestrians should be completely banned from all types of roads.

(D) Increasing the speed of vehicles is the only way to reduce congestion.

54. In modern green building standards like LEED or GRIHA, Carbon Sequestration in construction refers to

(A) Releasing CO_2 during the manufacturing of cement.

(B) The use of coal-based energy for site operations.

(C) The process by which building materials capture and store atmospheric CO_2.

(D) Increasing the carbon content in structural steel to make it harder.

55. Assertion (A): High-strength concrete mixes often utilize Fly Ash as a partial replacement for cement.

Reason (R): Fly Ash improves the workability of the fresh mix and enhances long-term strength through pozzolanic reactions.

Choose the correct answer:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(B) Both (A) and (R) are correct, but (R) is not the correct explanation of (A)

(C) (A) is correct but (R) is incorrect

(D) (A) is incorrect but (R) is correct

56. For a circular shaft subjected to pure torsion, the shear stress distribution across the section is

(A) Uniform throughout the entire cross-section.

(B) Maximum at the center and zero at the outer surface.

(C) Zero at the center and increases linearly to a maximum at the outer surface.

(D) Parabolic, with the maximum value at the neutral axis.

57. The "Unit Load Method" used for calculating deflections in structures is an application of which fundamental principle?

(A) Principle of Superposition

(B) Principle of Virtual Work

(C) Castigliano's Second Theorem

(D) Euler-Bernoulli Hypothesis

58. Consider the following statements regarding Built-up Columns

1. Lacings and battens are used to hold the individual components of a built-up column together so they act as a single unit.
2. Lacing bars are designed to resist a transverse shear force equal to 2.5% of the axial load on the column.
3. Battened columns are generally more efficient than laced columns for carrying very heavy eccentric loads.

Which of the statements given above are correct?

(A) 1 and 2 only (B) 2 and 3 only

(C) 1 and 3 only (D) 1, 2 and 3

59. In post-tensioning, the tensioning of the steel tendons is performed

(A) Before the concrete is poured into the formwork.

(B) Simultaneously while the concrete is being vibrated.

(C) After the concrete has hardened and achieved sufficient strength.

(D) Only when the structure is subjected to its full live load.

60. For an infrastructure project in India, Environmental Clearance (EC) is mandatory under the EIA Notification. The scoping stage in the EC process involves

(A) Identifying the potential environmental impacts.

(B) Monitoring the project after it has become operational.

(C) Handing over the land to the local community.

(D) Calculating the final tender price.

61. Which of the following items of work is NOT generally measured in square meters (m^2)?

(A) Plastering and Pointing

(B) Damp Proof Course

(C) Reinforced Cement Concrete for beams and columns

(D) Whitewashing and Distempering

62. A Cofferdam is a temporary structure built primarily to

(A) Act as a permanent foundation for a bridge pier.

(B) Provide housing for the construction workers.

(C) Increase the velocity of the river flow.

(D) Exclude water from an area to allow construction to be performed in the dry.

63. The Magnus Effect is a phenomenon associated with the generation of

(A) Drag on a stationary cylinder.

(B) Cavitation in hydraulic turbines.

(C) Lift on a rotating cylinder or sphere moving through a fluid.

(D) Water hammer in long pipelines.

64. Consider the following statements:

1. When two wells operate simultaneously in the same aquifer, their cones of depression may overlap.
2. Increasing well diameter significantly increases the discharge of a well for the same aquifer conditions.
3. Storage coefficient of a confined aquifer is typically much larger than that of an unconfined aquifer.

Which of the statements given above is/are correct?

(A) 1 only

(B) 1 and 2 only

(C) 2 and 3 only

(D) All of the above

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65. If the methyl orange alkalinity of water equals or exceeds total hardness, all of the hardness is

(A) non-carbonate hardness

(B) carbonate hardness

(C) pseudo hardness

(D) negative non-carbonate hardness

66. Geosynthetics used for the purpose of filtration must allow water to pass across the plane while

(A) Increasing the load-bearing capacity of the soil.

(B) Melting at high temperatures to seal the soil.

(C) Actively pumping water to the surface.

(D) Preventing the significant movement of soil particles.

67. Assertion (A): In Remote Sensing, the "Atmospheric Window" refers to the parts of the electromagnetic spectrum that are not significantly absorbed or scattered by the atmosphere.

Reason (R): Thermal infrared sensors typically operate in the 8.0 to 14.0 μm range because the atmosphere is highly transparent in this band.

Choose the correct option:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(B) Both (A) and (R) are correct, but (R) is not the correct explanation of (A).

(C) (A) is correct but (R) is incorrect.

(D) (A) is incorrect but (R) is correct.

68. Which mode of transport is generally considered the most cost-effective for moving large volumes of heavy bulk commodities (like coal or iron ore) over very long inland distances?

(A) Road transport

(B) Air transport

(C) Railway transport

(D) Water transport

69. When performing Ultrasonic Pulse Velocity (UPV) testing to assess concrete quality, which of the following factors would result in a "higher" pulse velocity reading?

(A) Presence of internal voids or honeycombing.

(B) High density and high modulus of elasticity of the concrete.

(C) High moisture content in the concrete.

(D) Both (B) and (C)

70. The Atal Bridge across the Sabarmati River in Ahmedabad is a modern landmark characterized by its

(A) Traditional arch-gravity design.

(B) Use of pre-cast concrete segments for heavy vehicular traffic.

(C) Iconic pedestrian-only steel truss design with a colourful tensile fabric roof.

(D) Single-pier suspension system over 500 meters long.

71. Consider the following statements regarding Traffic Calming Measures

1. Speed Humps are raised areas in the roadway designed to reduce vehicle speeds.
2. Rumble Strips provide tactile and auditory warnings to drivers who are drifting out of their lane.
3. Roundabouts generally increase the number of high-speed right-angle collisions at intersections.

Which of the statements given above are correct?

(A) 1 and 2 only (B) 2 and 3 only

(C) 1 and 3 only (D) 1, 2 and 3

72. The use of LiDAR (Light Detection and Ranging) in modern surveying allows engineers to

(A) Measure the chemical composition of the soil from a distance.

(B) Replace the need for any structural analysis software.

(C) Predict the exact date of the next earthquake.

(D) Create highly accurate 3D point clouds of existing structures or terrain using laser pulses.

73. The Soundness Test of cement, conducted using the Le Chatelier apparatus, is used to detect uncombined

(A) Alumina and Iron oxide
(B) Silica and Gypsum
(C) Lime and Magnesia
(D) Alkalies and Chlorides

74. Assertion (A): In a state of pure shear, the principal stresses are equal in magnitude but opposite in sign.

Reason (R): On the Mohr's circle for pure shear, the center coincides with the origin $(0,0)$.

Choose the correct option:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(B) Both (A) and (R) are correct, but (R) is not the correct explanation of (A)
(C) (A) is correct but (R) is incorrect
(D) (A) is incorrect but (R) is correct

75. Which of the following statements regarding "Bending Moments" and "Shear Forces" is incorrect?

(A) The rate of change of bending moment with respect to distance is equal to the shear force.
(B) At a point where the shear force changes sign, the bending moment is typically at a local maximum or minimum.
(C) In a cantilever beam with a point load at the free end, the bending moment is maximum at the free end.
(D) For a beam carrying a uniformly distributed load (UDL), the shear force diagram is linear.

76. The Net Effective Area (A_{net}) of a tension member, such as an angle section connected by one leg, is less than the gross area primarily due to

(A) The reduction in strength caused by the presence of bolt holes.
(B) The possibility of the member buckling under tension.
(C) The effect of shear lag in the unconnected leg
(D) The use of inferior quality steel in the connection zone.

77. In Staircase Design, the horizontal part of a step where the foot is placed is called the _____ and the vertical distance between two steps is the _____.

(A) Riser, Tread
(B) Tread, Riser
(C) Going, Nosing
(D) Pitch, Landing

78. Regarding Labour Safety and Welfare, which of the following is a requirement under the Building and Other Construction Workers (BOCW) Act?

(A) Providing safety helmets and boots to all workers.
(B) Ensuring the availability of drinking water and latrines at the site.
(C) Maintaining a register of accidents and dangerous occurrences.
(D) All of the above.

79. Assertion (A): In the Center Line Method of estimation, the total length of the center line is reduced by half the breadth of the main wall at every T-junction.

Reason (R): T-junctions cause a double counting of the corner area if the full center line length is used without correction.

Choose the correct answer:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(B) Both (A) and (R) are correct, but (R) is not the correct explanation of (A)
(C) (A) is correct but (R) is incorrect
(D) (A) is incorrect but (R) is correct

80. In "Functional Planning of Buildings", the principle of 'Prospect' refers to

(A) The internal arrangement of rooms for privacy.
(B) The view as seen from the outside of the building.
(C) The impressions that the house creates on a person looking at it from the outside.
(D) The provision of sufficient sunlight and air.

81. Consider the following statements regarding Pipe Networks

1. In a parallel pipe system, the head loss is the same in all branches.
2. In a series pipe system, the discharge remains the same through all pipes.
3. The Hardy Cross method is commonly used for the analysis of complex pipe networks.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

82. The probability of a 20-year flood to occur at least once in next 2 years is

(A) 8.5% (B) 45%

(C) 50% (D) 9.5%

83. Which of the following statements is not correct?

(A) Chlorides in potable water may be present from 300 ppm to 500 ppm.

(B) In order to be safe against pathogenic bacteria, residual chlorine should remain between 0.05 ppm and 0.20 ppm.

(C) Presence of iron and manganese in excess of 0.3 ppm in drinking water is objectionable.

(D) pH value for pure water is nearly 7.

84. According to the Indian Standard Soil Classification System (ISSCS), a soil represented by the symbol 'SM' is

(A) Silty Sand (B) Sandy Mud

(C) Clayey Silt (D) Well-graded Sand

85. In Field Astronomy, consider the following statements regarding the Celestial Sphere

1. The Zenith and Nadir are the points where the plumb line at the observer's station, if produced, meets the celestial sphere.
2. The Azimuth of a heavenly body is the arc of the horizon intercepted between the observer’s meridian and the vertical circle passing through the body.
3. The Declination of a star is analogous to the longitude on the Earth's surface. Which of the statements given above are correct?

(A) 1 and 2 only (B) 2 and 3 only

(C) 1 and 3 only (D) 1, 2 and 3

86. Select the incorrect statement regarding the comparison between Flexible and Rigid pavements

(A) Flexible pavements have a low initial cost but high maintenance cost.

(B) Rigid pavements have a long design life than flexible pavements.

(C) Flexible pavements can be opened to traffic shortly after construction.

(D) Rigid pavements are designed based on the California Bearing Ratio (CBR) of the soil.

87. High-Performance Concrete (HPC) often utilizes Silica Fume (Micro-silica) to achieve high strength. This is primarily due to

(A) The physical filler effect in the transition zone and the chemical pozzolanic reaction.

(B) Increasing the size of the capillary pores.

(C) Slowing down the hydration of C_3S to reduce heat.

(D) Reducing the need for any chemical admixtures.

88. Regarding the Dharoi Dam on the Sabarmati River, consider the following technical characteristics

1. It is a composite dam consisting of a masonry spillway and earthen flanks.
2. It is the primary source of drinking water for the cities of Ahmedabad and Gandhinagar.
3. Its catchment area lies primarily in the Aravalli hills of Rajasthan.

Which of the statements given above are correct?

(A) 1 and 2 only (B) 2 and 3 only

(C) 1 and 3 only (D) 1, 2 and 3

89. Assertion (A): The addition of shredded plastic waste in bituminous mixes improves the rutting resistance of the pavement.

Reason (R): Plastic modified bitumen has a higher Marshall Stability value and better viscoelastic properties at high service temperatures.

Choose the correct option:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(B) Both (A) and (R) are correct, but (R) is not the correct explanation of (A)

(C) (A) is correct but (R) is incorrect

(D) (A) is incorrect but (R) is correct

90. In the context of Infrastructure 4.0, the Internet of Things (IoT) is applied to bridges primarily for

(A) Real-time structural health monitoring through sensors that detect strain, vibration and tilt.

(B) Providing free Wi-Fi to the drivers.

(C) Increasing the height of the bridge automatically during floods.

(D) Changing the colour of the bridge based on the weather.

91. Consider the following statements regarding the properties and selection of building stones

1. Granite is highly suitable for ornamental work due to its ease of dressing and soft texture.

2. Slate is characterized by its excellent cleavage, making it suitable for use as a roofing material.

3. The specific gravity of a good building stone should generally be greater than 2.7.

Which of the statements given above are correct?

(A) 1 and 2 only **(B) 2 and 3 only**

(C) 1 and 3 only **(D) 1, 2 and 3**

92. Plane strain conditions are typically assumed to exist in which of the following structural members?

(A) Thin-walled pressure vessels.

(B) Large, thick structures like gravity dams or retaining walls.

(C) Thin plates loaded in their own plane.

(D) Slender beams under lateral loading.

93. In Computer-Aided Design (CAD) and Finite Element Analysis (FEA), "Discretization" refers to

(A) Increasing the load until the structure fails.

(B) The process of dividing a complex continuous structure into a finite number of smaller, simpler elements.

(C) Automatically generating the architectural floor plans.

(D) Reducing the number of independent variables to zero.

94. For a compression member, the Slenderness Ratio is defined as the ratio of

(A) Its total length to the radius of gyration.

(B) Its effective length to the least radius of gyration.

(C) The width of the section to its thickness.

(D) The applied axial load to the cross-sectional area.

95. When designing a Deep Beam according to IS 456:2000, which of the following statements is correct regarding the internal behaviour?

(A) The plane sections remain plane after bending, similar to shallow beams.

(B) The distribution of tensile stress is linear across the depth of the beam.

(C) The lever arm remains nearly constant and the structural action is primarily through an internal "arch and tie" mechanism.

(D) Shear reinforcement is not required if the span-to-depth ratio is less than 2.0.

96. The operating cost of construction equipment like an excavator includes

(A) Initial purchase price and taxes.

(B) Fuel, lubricants and the operator's wages.

(C) Depreciation and insurance interest.

(D) The cost of transporting the machine to the showroom.

97. The Schedule of Rates (SOR) is a document that contains

(A) Only the names of the qualified contractors in a district.

(B) The standard rates for various items of work.

(C) The architectural drawings of all government buildings.

(D) The chemical formulas for different types of cement.

98. Low-Cost Housing strategies often emphasize the use of

(A) Imported luxury finishing materials.

(B) Locally available materials and stabilized mud blocks or fly-ash bricks.

(C) Massive structural members with high factors of safety.

(D) Centralized air conditioning for all units.

99. For a body moving through a fluid, Skin Friction Drag is primarily caused by

(A) The shear stresses exerted by the fluid on the surface of the body.

(B) The pressure difference between the front and rear of the body.

(C) The formation of a wake behind the body.

(D) The weight of the body acting downwards.

100. Assertion (A): Increasing the live storage capacity of a reservoir can help in reducing the severity of downstream floods.

Reason (R): A reservoir with larger live storage can temporarily store a portion of incoming floodwater and release it gradually.

Choose the correct option:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(B) Both (A) and (R) are correct, but (R) is not the correct explanation of (A)

(C) (A) is correct but (R) is incorrect

(D) (A) is incorrect but (R) is correct

101. The analysis results of a raw water sample are provided below

Turbidity: 5 mg/L pH: 7.4

Fluorides: 2.5 mg/L Total Hardness: 300 mg/L

Iron: 3.0 mg/L MPN: 50 per 100 mL

Based on the above data, the water requires removal of

(A) turbidity followed by disinfection

(B) fluorides and hardness

(C) iron followed by disinfection

(D) fluorides, hardness and iron followed by disinfection

102. In soil exploration, the Standard Penetration Test (SPT) is widely used. If the measured 'N' value is corrected for overburden pressure and dilatancy, the 'N' value is generally recorded for a penetration of

(A) The first 150 mm

(B) The last 300 mm of a total 450 mm penetration

(C) The full 450 mm penetration

(D) Only the first 300 mm

103. A theodolite is called a transit theodolite, when its telescope can be revolved through a complete revolution about its

(A) Vertical axis in an inclined plane

(B) Horizontal axis in an inclined plane

(C) Vertical axis in a horizontal plane

(D) Horizontal axis in a vertical plane

104. Which of the following traffic surveys is most suitable for collecting data on the starting point and destination of trips to plan a new bypass road?

(A) Spot speed study

(B) Origin and Destination (O-D) survey

(C) Traffic volume count

(D) Accident study

105. Generally, as the water-cement ratio in a concrete mix increases, the strength of the concrete

(A) Increases

(B) Decreases

(C) Remains the same

(D) Becomes infinite

106. The Adalaj Stepwell (Adalaj ni Vav) is famous for its unique structural and functional planning, which ensures that

1. The temperature inside the well is about 6 degrees cooler than the outside.

2. It features an octagonal opening at the top to allow for light and ventilation.

3. The structure is built with a deep foundation of well-caissons.

Which of the statements given above is/are correct?

(A) 1 only

(B) 1 and 2 only

(C) 2 and 3 only

(D) 1, 2 and 3

107. In the E-waste or Steel Slag utilization in road bases, the main environmental benefit is

(A) It makes the road surface glow in the dark.

(B) It reduces the depletion of natural stone resources and solves the problem of industrial waste disposal.

(C) It eliminates the need for any rolling or compaction.

(D) It prevents any plant growth on the road shoulders.

108. Ultra-High Performance Concrete (UHPC) is characterized by

(A) Compressive strengths typically exceeding 120-150 MPa and excellent durability.

(B) A very high water-cement ratio to ensure flowability.

(C) The absence of any fine aggregates or silica fume.

(D) Its inability to resist any tensile loads.

109. In the manufacturing of bricks, the presence of excess Alumina (Al_2O_3) causes

(A) The brick to become brittle and weak.

(B) The brick to crack and warp during drying.

(C) Improvement in the impermeability of the brick.

(D) The brick to melt and lose its shape during burning.

110. In the theory of pure bending of beams, the "Neutral Axis" of the cross-section is the layer where

(A) The bending stress is maximum.

(B) The bending stress is zero.

(C) The shear stress is maximum.

(D) The tension is equal to the curvature.

111. In structural dynamics, damping is the property that

(A) Increases the amplitude of vibrations over time.

(B) Represents the number of equations governing the system.

(C) Causes the dissipation of energy, resulting in the gradual reduction of free vibration amplitude.

(D) Is only applicable to multi-degree of freedom (MDOF) systems.

112. In an Industrial Roof Truss, the members that directly support the roof covering material are known as

(A) Principal Rafters (B) Struts

(C) Sag rods (D) Purlins

113. Assertion (A): In Pre-stressed Concrete, the concept of "Load Balancing" is used to determine the tendon profile such that the upward pressure from the cable counteracts a specific portion of the external gravity loads.

Reason (R): For a parabolic tendon profile, the cable exerts a uniform upward pressure along the entire length of the beam.

Choose the correct answer:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(B) Both (A) and (R) are correct, but (R) is not the correct explanation of (A)

(C) (A) is correct but (R) is incorrect

(D) (A) is incorrect but (R) is correct

114. Site Investigation before construction is essential to determine

(A) The bearing capacity of the soil.

(B) The groundwater table level.

(C) The presence of any underground utilities or obstructions.

(D) All of the above.

115. When calculating the quantity of Earthwork in Excavation for a trench, the calculation is based on

(A) The volume of the loose soil after excavation.

(B) The area of the site multiplied by the height of the building.

(C) The weight of the soil transported by the trucks.

(D) The volume of the pit measured in its natural, undisturbed state.

116. Assertion (A): Plastering is used to provide a smooth, hard and decorative finish to the rough surface of the wall.

Reason (R): Plastering also acts as a protective layer against atmospheric influences like rain and wind.

Choose the correct option:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(B) Both (A) and (R) are correct, but (R) is not the correct explanation of (A)

(C) (A) is correct but (R) is incorrect

(D) (A) is incorrect but (R) is correct

117. In Open Channel Flow, the flow is characterized as critical when

(A) The Froude Number is equal to 1.0.

(B) The specific energy is minimum for a given discharge.

(C) The velocity of flow is equal to the celerity of a small gravity wave.

(D) All of the above.

118. A rating curve at a stream gauging station represents a relationship between

(A) discharge and stage at a specific location on a stream, generally at the gauging station

(B) velocity and stage at a specific location on a stream, generally at the gauging station

(C) discharge and velocity at a specific location on a stream, generally at the gauging station

(D) gauge height and critical velocity of a stream, generally at the gauging station

119. The design parameter for flocculation is given by a dimensionless number Gt, where G is the velocity gradient and t is the detention time. Values of Gt ranging from 10^4 to 10^5 are commonly used with t ranging from 10 to 30 min. The most preferred combination of G and t to produce smaller and denser flocs is

(A) large G values with short t

(B) large G values with long t

(C) small G values with short t

(D) small G values with long t

120. The selection of a Raft Foundation is most appropriate when

(A) The structural loads are very light and the soil has high bearing capacity.

(B) The foundation is required for a single, lightweight timber pole.

(C) The building is located in a region with no groundwater table.

(D) The allowable bearing pressure of the soil is low and the sum of individual footing areas exceeds about 50% of the total building area.

121. Tacheometric surveying is particularly adopted where

(A) obstacles, steep and broken ground deep ravines, etc. exist

(B) too many curves at the border exist

(C) measurement of bodies of water are involved

(D) limitations of space exist

122. The Stopping Sight Distance (SSD) of a vehicle depends on which of the following factors?

1. Total reaction time of the driver.
2. Speed of the vehicle.
3. Efficiency of the brakes.
4. Longitudinal friction between the tyre and the road.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1, 2 and 4 only
(D) All of the above

123. Consider the following statements regarding Extreme Weather Concreting

1. In hot weather, the high rate of evaporation can lead to plastic shrinkage cracking.
2. In cold weather, the hydration process of cement slows down significantly, delaying the gain in strength.
3. Using chilled water is a common practice to lower the temperature of the mix in hot climates.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

124. The Narmada Main Canal, which originates from the Sardar Sarovar Dam, is technically significant because

(A) It is the longest lined irrigation canal in the world.
(B) It flows entirely by pumping systems rather than gravity.
(C) It is an unlined canal designed to recharge groundwater along its path.
(D) It carries only industrial wastewater.

125. Reflective Pavement Markers (Road Studs/Cat's Eyes) are primarily installed on highways to

(A) Increase the aesthetic appeal of the road at night.
(B) Generate electricity from the pressure of passing tyres.
(C) Improve nighttime visibility of lane boundaries and guide drivers through curves.
(D) Act as a speed breaker for heavy trucks.

126. In the design of a Counterfort Retaining Wall, the stem slab acts as

(A) A cantilever fixed at the base slab.

(B) A circular slab resisting hoop tension.

(C) A simply supported beam spanning vertically.

(D) A continuous slab supported by the counterforts.

127. In a Centrifugal Pump, the primary function of the Volute Casing is to

(A) Increase the velocity of the liquid coming out of the impeller.

(B) Gradually convert the kinetic energy of the liquid into pressure energy.

(C) Reduce the overall weight of the pump assembly.

(D) Prevent the entry of air into the suction pipe.

128. Which one of the following is not a requirement for an ideal regime condition according to Lacey's regime theory?

(A) The channel carries a constant discharge and the flow remains uniform.

(B) The channel flows through soil of the same grade as the sediment entering it from the headworks.

(C) The grade and quantity of sediment entering the channel remain constant.

(D) The silt carried by the channel consists of clay-sized particles.

129. Consider the following statements regarding plumbing systems

1. Trap seals in plumbing systems prevent sewer gases from entering buildings.
2. Vent pipes in plumbing systems help maintain atmospheric pressure in drainage pipes.

Which of the above statements is/are correct?

(A) 1 only (B) 2 only

(C) Both 1 and 2 (D) None of the above

130. In Settlement Analysis, the Differential Settlement is defined as

(A) The difference in the settlement between two adjacent footings of a raft.

(B) The total vertical displacement of the entire foundation.

(C) The settlement that occurs immediately upon application of the load.

(D) The settlement caused by the weight of the excavated soil.

131. The direction of the steepest slope on a contour is

(A) Along the contour

(B) At an angle of 45° to the contour

(C) At right angles to the contour

(D) At an angle of 60° to the contour

132. The event in rock tunnelling are given below

1. Making tunnel profile
2. Loading explosive and blasting
3. Checking misfire
4. Mucking
5. Removing foul gases
6. Setting up and drilling
7. Guniting

Choose the correct sequence:

(A) 1, 6, 2, 5, 4, 3, 7

(B) 1, 6, 2, 5, 3, 4, 7

(C) 1, 6, 5, 3, 4, 2, 7

(D) 1, 2, 6, 3, 5, 4, 7

133. In the Flow of Loads in a typical RC-framed building, which of the following represents the correct sequence of gravity load transfer?

(A) Slab → Column → Beam → Foundation → Soil

(B) Slab → Beam → Column → Foundation → Soil

(C) Beam → Slab → Column → Foundation → Soil

(D) Column → Beam → Slab → Foundation → Soil

134. Consider the following statements regarding Air Vessels used in Reciprocating Pumps:

1. Air vessels are used to obtain a continuous supply of liquid at a uniform rate.
2. They reduce the possibility of separation of flow in the suction and delivery pipes.
3. By using air vessels, the frictional head loss in the pipes is significantly increased.

Which of the statements given above are correct?

(A) 1 and 2 only

(B) 2 and 3 only

(C) 1 and 3 only

(D) 1, 2 and 3

[Contd.

135. Consider the following statements regarding different types of dams

1. A gravity dam resists the horizontal water pressure primarily through its own weight and its design must ensure stability against sliding and overturning.
2. Embankment dams are generally constructed using compacted earth or rock materials and their safety largely depends on proper seepage control measures.
3. Concrete dams are typically suitable for narrow valleys with strong foundations and temperature stresses may develop in such dams during construction.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

136. The Sludge Volume Index (SVI) represents

(A) volume occupied by one gram of sludge after 30 minutes of settling in a graduated cylinder
(B) ratio of BOD to COD in wastewater
(C) concentration of suspended solids in mixed liquor
(D) volume of sludge produced per unit wastewater treated

137. Consider the following statements regarding Pile Load Tests

1. An Initial Test is performed on a working pile to verify the design load.
2. A Routine Test is performed on a test pile to determine the ultimate load capacity.
3. The Cyclic Load Test is used to separate the skin friction and point bearing components of the pile capacity.

Which of the statements given above is/are correct?

(A) 1 and 2 only
(B) 2 only
(C) 3 only
(D) 1, 2 and 3

138. In Photogrammetry, the relief displacement of a point on a vertical photograph is

(A) Inversely proportional to the flying height above the datum.
(B) Directly proportional to the distance of the image point from the principal point.
(C) Zero for a point located exactly at the nadir point of the photograph.
(D) All of the above are correct

139. Which of the following advantages are correct regarding poly-centric shape tunnel?

1. It can be conveniently used for road and railway traffic
2. The number of centres and lengths of radii cannot be fixed
3. It can resist external and internal pressure due to its arch action

(A) 1 and 2 only
(B) 1 and 3 only
(C) 2 and 3 only
(D) 1, 2 and 3

140. For the Limit State of Collapse, which of the following load combinations is NOT prescribed by IS 456:2000?

(A) 1.5(DL + LL)
(B) 1.2(DL + LL + WL)
(C) 1.5(DL + WL)
(D) 1.0(DL + LL + WL)

141. Which type of hydraulic turbine is most suitable for a project with a Low Head (less than 30 m) and a High Discharge?

(A) Pelton Wheel
(B) Francis Turbine
(C) Kaplan Turbine
(D) Turgo Turbine

142. Consider the following statements regarding the use of GIS in irrigation management

1. GIS can integrate spatial datasets such as soil type, land use, topography and canal network to support irrigation planning.
2. GIS analysis can help identify areas prone to waterlogging by combining groundwater depth data with terrain elevation information.
3. GIS alone can directly measure soil moisture and groundwater levels in irrigated fields without the need for field observations or remote sensing data.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

143. Assertion (A): Separate sewer systems are often preferred in modern urban planning.

Reason (R): Separate systems reduce the hydraulic load on treatment plants during heavy rainfall.

Choose the correct option:

(A) Both (A) and (R) are correct and (R) explains (A)
(B) Both (A) and (R) are correct but (R) does not explain (A)
(C) (A) is correct, (R) is incorrect
(D) (A) is incorrect, (R) is correct

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144. The Factor of Safety (FOS) against the sliding of an Earthen Slope is defined as the ratio of

(A) Driving force to Resisting force.

(B) Maximum shear strength to the mobilized shear stress along the failure surface.

(C) Total weight of the slope to the pore water pressure.

(D) Height of the slope to the depth of the hard strata.

145. Curvature correction to the staff reading in a differential levelling survey is

(A) Always subtractive

(B) Always zero

(C) Always positive

(D) Depending upon the latitude

146. Dust control during the drilling and mucking phases in a tunnel is essential primarily to

(A) Protect the health of workers from respiratory diseases like silicosis.

(B) Prevent the machinery from getting dirty.

(C) Increase the temperature inside the tunnel.

(D) Reduce the weight of the muck for easier disposal.

147. Consider the following statements regarding the "Structural Layout" for an RC building

1. Columns should preferably be located at or near the corners of a building and at the intersection of walls.
2. Beams are generally provided under the walls to transfer the partition loads directly to the columns.
3. To ensure lateral stability, the center of mass and center of rigidity of the building should be kept as far apart as possible.

Which of the statements given above are correct?

(A) 1 and 2 only

(B) 2 and 3 only

(C) 1 and 3 only

(D) 1, 2 and 3

148. A Draft Tube is an essential component of a Reaction Turbine because it

(A) Increases the pressure at the runner exit above atmospheric pressure

(B) Allows the turbine to be set above the tailrace level without losing head

(C) Converts the kinetic energy rejected at the runner exit into useful pressure energy

(D) Both (B) and (C)

149. A repelling groyne in a river is

(A) inclined towards downstream at 30°

(B) inclined towards upstream at 30°

(C) perpendicular to the bank

(D) none of these

150. When are drop manholes provided in a sewerage system?

(A) When there is change from gravity system to pressure system.

(B) When there is change in the elevation of the ground level.

(C) When there is change in the diameter of the sewer.

(D) When there is change in the direction of the sewer line.

151. In Earthen Embankments, a Phreatic Line is defined as

(A) The line representing the top-most flow line where the pressure is atmospheric.

(B) The line connecting all points of equal pore water pressure.

(C) The boundary between the clay core and the rock toe.

(D) The line indicating the maximum depth of excavation.

152. Which of the following geological conditions is likely to cause the most trouble during the excavation of a tunnel?

(A) Presence of massive, dry igneous rock.

(B) Crossing a zone of highly fractured rock with a high groundwater table.

(C) Tunneling through a consistent, thick layer of hard quartzite.

(D) Vertical bedding planes that are perpendicular to the tunnel axis.

153. When disposing of muck in a very long tunnel with a small diameter, which transportation system is usually the most efficient?

(A) Manual labour with wheelbarrows.

(B) Large heavy-duty dump trucks.

(C) Narrow-gauge rail tracks with mine cars.

(D) Overhead cranes.

154. Assertion (A): In the preparation of a structural layout, "Secondary Beams" are often used to reduce the span of the slabs.

Reason (R): Reducing the slab span decreases the thickness of the slab required and limits the deflection.

Choose the correct answer:

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(B) Both (A) and (R) are correct, but (R) is not the correct explanation of (A)

(C) (A) is correct but (R) is incorrect

(D) (A) is incorrect but (R) is correct

155. In Hydropower terminology, Pondage refers to

(A) The massive storage behind a dam intended for seasonal use.

(B) A small amount of water storage immediately behind the powerhouse or weir for hourly or daily fluctuations in load.

(C) The water lost due to evaporation from the reservoir surface.

(D) The water that flows over the spillway during a flood.

156. The maximum uplift pressure on the floor of a siphon aqueduct is likely to occur when

(A) There is high flood flow in the drainage channel while the canal is dry

(B) The canal is carrying full supply discharge while the drainage channel is dry

(C) There is high flood flow in the drainage channel while the canal is running full

(D) Water level is at the drainage bed while the canal is dry

157. When sewage enters a flowing river, the rapid depletion of dissolved oxygen is due to

(A) change in temperature in river water

(B) the suspended particles in river and waste

(C) respiratory activity of aquatic plants in the river

(D) microbial activity

158. Electro-osmosis is a ground water control technique most effectively used in

(A) Clean gravels with high permeability.

(B) Fractured rock formations.

(C) Fine-grained soils like silts and clays where hydraulic drainage is difficult.

(D) Dry desert sands to increase moisture.

159. In structural geology, a fold in which the rock layers are bent upwards like an arch is called a/an

(A) Anticline

(B) Syncline

(C) Overturned fold

(D) Recumbent fold

160. The process of transferring the centerline from the ground surface to the tunnel interior through a deep vertical shaft is typically done using

(A) A standard magnetic compass.

(B) Simple visual sighting from the top of the shaft.

(C) A GPS receiver placed at the bottom of the shaft.

(D) Two or more heavy plumb bobs suspended in a bucket of oil or water.

161. Which of the following is an Obligatory Requirement during the structural layout planning to ensure the ductility of an RC frame in seismic zones?

(A) Keeping the column size smaller than the beam size.

(B) Aligning beams such that their centerlines coincide with the column centerlines to avoid eccentricity.

(C) Providing the maximum possible spacing between lateral ties.

(D) Using only plain mild steel bars for main reinforcement.

162. In the layout of a power house, the Surge Tank is provided in the penstock line primarily to

(A) Increase the velocity of water striking the turbine.

(B) Filter out silt and debris before the water enters the turbine.

(C) Store water for use during the dry season.

(D) Protect the penstock from water hammer pressures during sudden load changes.

163. Sardar Sarovar dam is a type of

(A) Composite dam
(B) Earthen dam
(C) Gravity dam
(D) Arch dam

164. What is the function of Aerobic Biological Attached Growth Process in waste water treatment?

(A) Conversion of suspended organic matter into settleable biofloc and stable inorganics.
(B) Removal of organic settleable solids.
(C) Conversion of organic matter into CH_4 & CO_2 and relatively stable organic residue.
(D) Removal of inorganic suspended solids

165. A Sheet Pile Wall is a type of earth retaining structure that derives its stability primarily from

(A) Its own massive self-weight.
(B) The friction between the masonry blocks.
(C) The use of high-strength structural adhesive.
(D) Passive earth pressure resistance of the soil into which it is embedded.

166. Consider the following statements regarding 'Faults'

1. A fault is a fracture in rock where there has been significant displacement.
2. Building a dam directly over an active fault line is generally avoided due to the risk of earthquake-induced movement.

Which of the statements given above is/are correct?

(A) 1 only
(B) 2 only
(C) Both 1 and 2
(D) Neither 1 nor 2

167. For effective drainage in a tunnel, it is generally preferred to provide

(A) A perfectly flat longitudinal profile to prevent water flow.
(B) Large open ditches in the center of the roadway.
(C) A slight longitudinal slope to allow water to flow by gravity to a sump or portal.
(D) High-pressure pumps at every 10 meters of tunnel length.

168. As per IS 875 (Part 2), for the design of a residential building, the imposed load on the floors of dwelling units is generally taken as

(A) 1.5 kN/m^2 (B) 3.0 kN/m^2

(C) 2.0 kN/m^2 (D) 5.0 kN/m^2

169. The cavitation phenomenon in hydraulic turbines typically occurs at

(A) The inlet of the guide vanes.

(B) The exit of the runner or the entrance of the draft tube where pressure is lowest.

(C) The center of the main shaft.

(D) The surface of the trash rack.

170. At the foot of a spillway, the jump rating curve is below the tail water curve at low flows and above it at high flows. The suitable type of energy dissipater for this situation is

(A) A ski-jump bucket (B) A horizontal apron

(C) A sloping apron (D) A stilling pool

171. The loading rate in an activated sludge plant can be expressed using which of the following parameters?

1. Aeration period or hydraulic retention time (HRT)
2. BOD loading per unit volume of the aeration tank
3. Food-to-microorganism (F/M) ratio
4. Sludge concentration

From the parameters listed above, identify the correct ones that define the loading conditions of an activated sludge process.

(A) 1 and 3 (B) 1, 3 and 4

(C) 2, 3 and 4 (D) All of the above

172. The direction of a horizontal line on an inclined rock bed is known as its

(A) Dip (B) Strike

(C) True Dip (D) Apparent Dip

173. In the Drill and Blast method of tunnel construction, the term 'Mucking' refers to

(A) The process of drilling holes for explosives.

(B) The removal of excavated rock and debris from the tunnel face.

(C) The application of shotcrete to the tunnel walls.

(D) The installation of ventilation pipes.

174. In the context of earthquake-resistant masonry features, Horizontal Bands are provided primarily to

(A) Increase the thermal insulation of the building.

(B) Connect the walls together so they act as a single box-like unit during shaking.

(C) Reduce the amount of cement required for the mortar.

(D) Support the vertical weight of the roof only.

175. In a natural open channel flow system with a mobile bed, which of the following statements is correct?

(A) The degrees of freedom (DOF) represent the total number of equations governing the system.

(B) The degrees of freedom (DOF) represent the number of dependent variables required to describe the flow.

(C) The degrees of freedom (DOF) represent the number of independent variables required to describe the flow conditions.

(D) The degrees of freedom (DOF) are always equal to 2 in open channel flow systems.

176. For stability analysis of an embankment dam of homogeneous earth, the failure surface is assumed to be

(A) along the phreatic surface

(B) along the foundation surface

(C) circular slip surface on upstream face and downstream face

(D) circular slip surface on downstream face only

177. Which of the following statements is/are TRUE for the Refuse-Derived Fuel (RDF) in the context of Municipal Solid Waste (MSW) management?

(A) Higher Heating Value (HHV) of the unprocessed MSW is higher than the HHV of RDF processed from the same MSW

(B) RDF can be made in the powdered form

(C) Inorganic fraction of MSW is mostly converted to RDF

(D) RDF cannot be used in conjunction with oil

178. According to Indian Roads Congress (IRC) standards, which loading class is generally adopted for bridges located in industrial areas or on prestigious routes like National Highways?

(A) IRC Class B loading

(B) IRC Class A loading

(C) IRC Class AA or Class 70R loading

(D) IRC Class C loading

179. Modal Analysis of a building frame is required when

(A) The building is tall, irregular in shape, or has a non-uniform distribution of mass and stiffness.

(B) The building is very low and symmetrical.

(C) The building is constructed only of timber.

(D) The foundation is on hard rock.

180. The calorific value of solid waste represents

(A) amount of heat released during combustion of waste

(B) moisture content present in solid waste

(C) amount of biodegradable matter in waste

(D) percentage of recyclable materials in waste

181. Which type of bridge is most suitable for crossing deep gorges or valleys where the construction of intermediate piers is difficult and the span is moderately long?

(A) R.C.C. T-beam Bridge

(B) Arch Bridge

(C) Slab Bridge

(D) Simple Girder Bridge

[Contd.

182. Ductile Detailing of RC members as per IS 13920 is essential to

(A) Increase the initial stiffness of the building.

(B) Make the building lighter by using less reinforcement.

(C) Allow the structure to undergo large inelastic deformations without sudden collapse.

(D) Ensure that the beams are stronger than the columns.

183. Which of the following statements related to C/N (Carbon/Nitrogen) ratio is not correct?

(A) Lower initial C/N ratio leads to loss of nitrogen and slows down the rate of decomposition

(B) Higher initial C/N ratio leads to cell destruction to obtain nutrition

(C) Higher initial C/N ratio leads to lower conservation of nitrogen in the finished compost

(D) An initial C/N ratio of 30 to 50 is optimal for composting

184. What is the primary function of "Bearings" in a bridge structure?

(A) To transmit the loads from the superstructure to the substructure.

(B) To increase the dead load of the superstructure for stability.

(C) To protect the piers from the impact of floating debris.

(D) To provide a smooth riding surface for vehicles.

185. In the design of lateral load-resisting systems, Soft Storey irregularity occurs when

(A) The lateral stiffness of a storey is less than 70% of that in the storey above.

(B) The floor height is very small compared to the storey above.

(C) The building is painted with soft-texture colours.

(D) There is an excess of partition walls in a particular floor.

186. Which of the following statements related to beneficial utilization of wastes is not correct?

(A) Waste recycling reduces demand for natural resources

(B) Some industrial wastes can be used as construction materials

(C) Waste utilization always eliminates environmental impacts completely

(D) Proper processing is often required before waste reuse

187. In the design of Bridge Foundations, Well Foundations are preferred for major bridges over deep sandy rivers because

(A) They are cheaper than shallow foundations.

(B) They are only used for pedestrian bridges.

(C) They do not require any specialized machinery for installation.

(D) They can be sunk to great depths to reach a stable strata below the maximum scour level.

188. Which structural control method involves the use of Base Isolation to protect a building?

(A) Increasing the thickness of all shear walls.

(B) Decoupling the structure from the ground using flexible bearings to increase its natural period.

(C) Adding extra mass to the top of the building to reduce vibrations.

(D) Using higher grades of concrete in the foundation.

189. Consider the following statements regarding reuse of solid wastes in civil engineering

1. Fly ash can be used in manufacturing cement and concrete.

2. Construction and demolition waste can be processed and reused as aggregates.

Choose the correct statement:

(A) 1 only

(B) 2 only

(C) Both 1 and 2

(D) None of the above

190. During the testing of bridges, a Load Test is typically conducted on a newly completed bridge to

(A) Determine the chemical composition of the concrete.

(B) Measure the wind speed at the bridge deck level.

(C) Calculate the exact cost of construction.

(D) Verify the structural behaviour and check if the actual deflections are within the design limits.

191. Seismic Strengthening or Retrofitting of an existing building is performed to

(A) Change the architectural look of the building.

(B) Increase the number of floors in the building without changing the columns.

(C) Repair minor cosmetic cracks in the plaster.

(D) Upgrade the seismic resistance of a building that was not originally designed for current code requirements.

192. Consider the following regarding solid waste management planning

1. Waste generation rate is an important parameter in designing waste management systems.
2. Population growth influences future waste management requirements.
3. Waste composition analysis is unnecessary in planning disposal facilities.

Which of the above statements are correct?

(A) 1 and 2 only (B) 2 and 3 only

(C) 1 and 3 only (D) 1, 2 and 3

193. Expansion Joints in bridge superstructures are provided to

(A) Accommodate the thermal expansion and contraction of the bridge deck.

(B) Increase the rigidity of the deck slab.

(C) Prevent the bridge from vibrating under heavy traffic.

(D) Connect the main girders to the cross-beams.

194. As per IS 1893, the Zone Factor (Z) for a building located in Zone V is taken as

(A) 0.10 (B) 0.16

(C) 0.24 (D) 0.36

195. In Bangalore and Indore, the processes of composting are classified to which of the following?

(A) Both anaerobic processes

(B) Both aerobic processes

(C) Anaerobic process and aerobic process, respectively

(D) Aerobic process and anaerobic process, respectively

196. In bridge maintenance, the process of injecting cement grout or chemicals into cracks in concrete to restore structural integrity is known as

(A) Painting
(B) Scouring
(C) Grouting
(D) Pointing

197. Which of the following statements best describes the Philosophy of Earthquake-Resistant Design as per IS 1893?

(A) The building should remain completely undamaged during a Maximum Considered Earthquake (MCE).
(B) The building should remain functional with no structural damage during a minor earthquake, but may undergo repairable damage during a moderate earthquake and survive without collapse during a major earthquake.
(C) Earthquake-proof design is a standard requirement for all residential buildings to ensure zero cracking.
(D) The structure is designed to remain purely elastic even during the strongest possible ground shaking.

198. Which one of the following statements is TRUE for Greenhouse Gas (GHG) in the atmosphere?

(A) GHG absorbs the incoming short wavelength solar radiation to the earth surface and allows the long wavelength radiation coming from the earth surface to pass through
(B) GHG allows the incoming long wavelength solar radiation to pass through to the earth surface and absorbs the short wavelength radiation coming from the earth surface
(C) GHG allows the incoming long wavelength solar radiation to pass through to the earth surface and allows the short wavelength radiation coming from the earth surface to pass through
(D) GHG allows the incoming short wavelength solar radiation to pass through to the earth surface and absorbs the long wavelength radiation coming from the earth surface

199. In the Seismic Coefficient Method, the Design Horizontal Seismic Coefficient (A_h) is calculated using which of the following parameters?

1. Zone factor (Z)

2. Importance factor (I)

3. Response Reduction Factor (R)

4. Average Response Acceleration Coefficient (S_a/g)

Select the correct combination:

(A) 1 and 2 only **(B) 1, 2 and 3 only**

(C) 1, 3 and 4 only **(D) 1, 2, 3 and 4**

200. Fanning type of plume behaviour takes place when

(A) Superadiabatic lapse rate prevails with light to moderate wind speed

(B) There exists a strong superadiabatic lapse rate above a surface of inversion

(C) Extreme inversion conditions exist in the presence of light wind

(D) Plume is caught between two inversion layers