RITES
AM

Previous Year Paper
(Civil)
05 May, 2024

1. Which of the following is **NOT** a primary soil particle size classification according to the Unified Soil Classification System (USCS)?
   a) Gravel
   b) Silt
   c) Clay
   d) Loam

2. The process by which water is forced out of a saturated soil mass due to an applied load is called:
   a) Consolidation
   b) Percolation
   c) Compaction
   d) Osmosis

3. What is the apparatus commonly used to determine the liquid limit?
   a) Casagrande's apparatus
   b) Hydrometer
   c) Cone penetrometer
   d) Proctor compactor

4. The angle of internal friction is a key parameter in soil mechanics. Which of the following types of soil typically exhibits the highest angle of internal friction?
   a) Sand
   b) Clay
   c) Silt
   d) Loam

5. The relationship between the void ratio and effective stress in a soil mass is described by which of the following?
   a) Terzaghi's principle
   b) Coulomb's law
   c) Rankine's theory
   d) Poisson's ratio

6. Which test is used to determine the maximum dry density and optimum moisture content of soil for compaction purposes?
   a) Atterberg limits test
   b) Proctor compaction test
   c) Sieve analysis test
   d) Direct shear test

7. What is the coefficient of permeability a measure of in soil mechanics?
   a) Shear strength
   b) Compressibility
   c) Rate of water flow through soil
   d) Soil density

8. Which of the following is **NOT** a typical method for stabilizing expansive soils?
   a) Lime stabilization
   b) Cement stabilization
   c) Bitumen stabilization
   d) Gypsum stabilization

9. The Plasticity Index (PI) of a soil is determined by the difference between which two soil properties?
   a) Liquid limit and plastic limit
   b) Dry density and void ratio
   c) Shear strength and compressibility
   d) Coefficient of permeability and porosity

10. Which of the following types of foundation is most suitable for transferring heavy loads to deeper, more stable soil or rock strata?
   a) Pile foundation
   b) Raft foundation
   c) Shallow foundation
   d) Open foundation

11. What type of pile foundation derives its load-bearing capacity mainly from frictional resistance along the sides of the pile shaft?
   a) End-bearing pile
   b) Friction pile
   c) Sheet pile
   d) Bored pile

12. Which of the following factors does **NOT** typically influence the selection of a foundation type for a given structure?
   a) Soil-bearing capacity
   b) Structural loads
   c) Geological conditions
   d) Construction cost

13. What is the primary purpose of using a pile cap in a pile foundation system?
   a) To transfer loads from the superstructure to the piles
   b) To prevent lateral movement of the piles
   c) To increase the bearing capacity of the soil
   d) To provide additional vertical support to the piles

14. Which type of shallow foundation is commonly used for structures with relatively low loads and where soil conditions are favorable?
   a) Spread footing
   b) Mat foundation
   c) Strap footing
   d) Combined footing

15. Which of the following methods is **NOT** used for improving the bearing capacity of soil in foundation engineering?
    a) Soil compaction
    b) Soil stabilization
    c) Groundwater lowering
    d) Soil liquefaction

16. What is the purpose of a levelling instrument in surveying?
    a) To measure vertical angles
    b) To measure horizontal distances
    c) To establish benchmarks for elevation
    d) To measure magnetic declination

17. Which type of surveying method uses trigonometry to calculate distances and angles from known points?
    a) Plane table surveying
    b) Compass surveying
    c) Triangulation surveying
    d) Chain surveying

18. In surveying, what is the term for the difference in elevation between two points?
    a) Horizontal distance
    b) Vertical angle
    c) Benchmark
    d) Vertical interval

19. Which surveying method is most suitable for large-scale mapping of extensive areas with high accuracy?
    a) Plane table surveying
    b) Photogrammetry
    c) Compass surveying
    d) Tachometry

20. What is the primary purpose of a theodolite in surveying?
    a) To measure horizontal and vertical angles
    b) To measure distances
    c) To establish control points
    d) To determine magnetic declination

21. Which type of surveying instrument is used for measuring short distances with high precision?
    a) Total station
    b) Level
    c) Ranging rod
    d) Ranging pole

22. In surveying, what does the acronym EDM stand for?
    a) Electronic Distance Measurement
    b) Estimated Distance Measurement
    c) Environmental Distance Monitoring
    d) Engineered Distance Mapping

23. Which surveying method involves using aerial photographs to create accurate maps and models of the Earth's surface?
    a) Photogrammetry
    b) GPS surveying
    c) Tachometry
    d) Remote sensing

24. In the CBR Test, the standard load value for 5 mm penetration is:
    a) 1370 kg
    b) 2055 kg
    c) 2630 kg
    d) 3180 kg

25. In the Classification of Soil, Plasticity Chart is:
    a) Plasticity Index vs Liquid Limit
    b) Plasticity Limit vs Liquid Limit
    c) Plasticity Index vs Liquidity Index
    d) None of the above

26. Which of the following materials is primarily composed of calcium carbonate and is commonly used as a building material?
    a) Concrete
    b) Brick
    c) Steel
    d) Limestone

27. What is the primary ingredient in the production of Portland cement?
    a) Gypsum
    b) Lime
    c) Silica
    d) Clinker

28. Which of the following types of wood is known for its high strength and resistance to decay, making it suitable for outdoor construction?
    a) Cedar
    b) Pine
    c) Oak
    d) Mahogany

29. What type of roofing material is known for its durability, fire resistance, and ability to reflect sunlight?
    a) Asphalt shingles
    b) Metal roofing
    c) Clay tiles
    d) Thatched roofing

30. Which material is commonly used as a thermal insulation in buildings due to its low thermal conductivity and resistance to moisture?
    a) Fiberglass
    b) Concrete
    c) Steel
    d) Aluminum

31. Which of the following is a measure of the intensity of an earthquake at a specific location?
    a) Richter scale
    b) Mercalli scale
    c) Seismic magnitude
    d) Moment magnitude

32. Which structural element is designed to resist lateral forces caused by earthquakes and wind loads?
    a) Shear wall
    b) Beam
    c) Column
    d) Foundation

33. Which of the following construction techniques is commonly used to improve a building's seismic resistance?
    a) Base isolation
    b) Post-tensioning
    c) Reinforced masonry
    d) Prefabrication

34. In reinforced concrete design, what is the term used to describe the ratio of the ultimate moment capacity of a section to the moment of resistance provided by concrete alone?
    a) Factor of safety
    b) Design moment ratio
    c) Flexural strength ratio
    d) Capacity reduction factor

35. Which of the following limit states is **NOT** typically considered in the design of reinforced concrete structures?
    a) Flexure
    b) Shear
    c) Torsion
    d) Buckling

36. What is the primary function of shear reinforcement in reinforced concrete beams?
    a) Increase bending moment capacity
    b) Enhance ductility
    c) Prevent shear failure
    d) Improve bond strength

37. In the design of reinforced concrete columns, what does the term "slenderness ratio" refer to?
    a) Ratio of effective length to least lateral dimension
    b) Ratio of axial load to cross-sectional area
    c) Ratio of moment of inertia to section modulus
    d) Ratio of clear span to effective depth

38. Which of the following factors has the most significant influence on the deflection of a reinforced concrete beam under service loads?
    a) Concrete strength
    b) Reinforcement ratio
    c) Span length
    d) Load duration

39. What is the main advantage of using high-strength concrete in reinforced concrete construction?
    a) Reduced material costs
    b) Increased durability
    c) Improved fire resistance
    d) Greater structural efficiency

40. Which of the following types of beams is commonly used in bridges to support heavy loads over long spans?
    a) T-beam
    b) I-beam
    c) Box beam
    d) L-beam

41. Which type of foundation is commonly used to support tall reinforced concrete structures with heavy vertical loads?
    a) Pad foundation
    b) Strip foundation
    c) Raft foundation
    d) Strap foundation

42. What is the primary function of transverse reinforcement in reinforced concrete columns?
    a) Increase axial load capacity
    b) Enhance ductility
    c) Reduce deflection
    d) Improve bond strength

43. In reinforced concrete design, what does the term "eccentricity" refer to?
    a) Distance between the centroid of the compression and tension zones
    b) Distance between the centroid of the section and the neutral axis
    c) Distance between the centerline of the column and the applied load
    d) Distance between the centerline of the beam and the applied load

44. What does the term "moment redistribution" refer to in the design of reinforced concrete structures?
    a) Redistribution of bending moments along the beam length
    b) Redistribution of reinforcement along the beam depth
    c) Redistribution of axial loads in columns
    d) Redistribution of shear forces in beams

45. What does IS 13920 primarily focus on in reinforced concrete structures?
    a) Material properties
    b) Structural design
    c) Ductile detailing
    d) Construction practices

46. According to IS 456, what is the minimum cover required for reinforcement in mild exposure conditions?
    a) 15 mm
    b) 20 mm
    c) 25 mm
    d) 30 mm

47. In IS 13920, what does the term "ductile detailing" refer to?
    a) Providing adequate reinforcement
    b) Ensuring proper curing of concrete
    c) Enhancing seismic resistance
    d) Improving structural aesthetics

48. According to IS 456, what is the recommended minimum grade of concrete for reinforced concrete structures in severe exposure conditions?
    a) M15
    b) M20
    c) M25
    d) M30

49. What does IS 13920 recommend regarding the detailing of reinforcement in regions of high seismic activity?
    a) Increasing reinforcement diameter
    b) Providing additional stirrups
    c) Increasing concrete cover
    d) Using special concrete additives

50. In friction circle method of slope stability analysis, if R defines the radius of the slip circle, the radius of friction circle is:
    a) $R \sin\phi$
    b) R
    c) $R \cos\phi$
    d) $R \tan\phi$

51. Net ultimate bearing capacity of a footing embedded in a clay stratum:
    a) Increases with depth of footing only
    b) Increases with size of footing only
    c) Increases with depth and size of footing
    d) Is independent of depth and size of footing

52. Which of the following causes stresses in Sleepers?
    a) Eccentric vertical loads
    b) Contact sheer stress of wheel and rail
    c) Lateral deflection of sleepers
    d) Track components

53. Track modulus is defined as:
    a) Load/unit length of sleeper
    b) Load/unit length of sleeper to produce depression in rail
    c) Load/unit length of rail to produce depression in sleeper
    d) Load/unit length of rail to produce unit depression/deflection in track

54. The application of _____ diagram is used to find the orientation of the runway to get the desired wind coverage.
    a) Wind Butterfly
    b) Wind Cycle
    c) Wind Star
    d) Wind Rose

55. The height of the pilot's eye above the runway surface is assumed as:
    a) 4 m
    b) 3 m
    c) 1 m
    d) 8 m

56. At a certain station, the mean of the average temperature is 25°C and the mean of the maximum daily temperature is 40°C. What is the airport reference temperature (ART)?
    a) 20.6°C
    b) 25°C
    c) 30°C
    d) 38.6°C

57. What is the primary difference between determinate and indeterminate structures?
    a) Number of members
    b) Degree of freedom
    c) Material properties
    d) Loading conditions

58. Which method of structural analysis is based on the principle of equilibrium and compatibility?
    a) Force method
    b) Moment distribution method
    c) Stiffness method
    d) Finite element method

59. What is the purpose of using influence lines in structural analysis?
    a) To determine member forces
    b) To evaluate structural stability
    c) To analyze dynamic loads
    d) To calculate deflections

60. Which method of structural analysis is particularly useful for analyzing continuous beams and frames?
    a) Slope-deflection method
    b) Matrix displacement method
    c) Flexibility method
    d) Column analogy method

61. Plastic analysis is primarily used for designing structures subjected to:
    a) Static loads
    b) Dynamic loads
    c) Wind loads
    d) Seismic loads

62. Which factor is **NOT** considered in the design of earthquake-resistant structures?
    a) Damping ratio
    b) Seismic intensity
    c) Soil type
    d) Material strength

63. Creep and shrinkage primarily affect the:
    a) Strength of materials
    b) Stiffness of materials
    c) Long-term behaviour of structures
    d) Short-term behaviour of structures

64. Deflection limits for structural members are primarily based on:
    a) Material properties
    b) Loading conditions
    c) Serviceability criteria
    d) Structural stability

65. The column analogy method is based on the analogy between:
    a) Columns and beams
    b) Trusses and frames
    c) Columns and trusses
    d) Beams and frames

66. The matrix method is particularly useful for analyzing:
    a) Trusses
    b) Frames
    c) Beams
    d) Columns

67. Dynamic analysis of structures primarily involves studying their response to:
    a) Static loads
    b) Vibratory loads
    c) Wind loads
    d) Temperature variations

68. The flexibility method in structural analysis is based on:
    a) Equilibrium equations
    b) Compatibility equations
    c) Material properties
    d) Force-displacement relationships

69. Which type of pre-stressed concrete member is commonly used in offshore structures due to its ability to resist lateral loads and bending moments?
    a) Pre-stressed beams
    b) Pre-stressed slabs
    c) Pre-stressed piles
    d) Pre-stressed walls

70. In pre-stressed concrete design, what is the purpose of using a concrete with high early strength for pre-tensioned members?
    a) To reduce the construction time
    b) To increase the long-term durability
    c) To decrease the initial pre-stressing force
    d) To improve the appearance of the structure

71. What is the purpose of using bracing in steel structures?
    a) To increase the aesthetic appeal
    b) To resist lateral loads
    c) To decrease the overall weight
    d) To increase the thermal conductivity

72. Which of the following is **NOT** a commonly used steel section in structural design?
    a) I-beam
    b) HSS (Hollow Structural Section)
    c) Channel section
    d) C-section

73. What is the primary function of stiffeners in steel structures?
    a) To increase the structural damping
    b) To reduce the overall weight
    c) To prevent local buckling
    d) To improve the aesthetic appeal

74. Which of the following is **NOT** a commonly used method for connecting steel members?
    a) Welding
    b) Bolting
    c) Adhesive bonding
    d) Riveting

75. What does LRFD stand for in the context of steel design?
    a) Limiting Resistance Factor Design
    b) Load and Resistance Factor Design
    c) Load-Reducing Factor Design
    d) Linear Resistance Factor Design

76. The phenomenon of 'fatigue failure' in steel structures is primarily caused by:
    a) Excessive loading
    b) Corrosion
    c) Repeated cyclic loading
    d) Temperature fluctuations

77. Which type of steel connection allows for rotation between connected members?
    a) Rigid connection
    b) Pinned connection
    c) Semi-rigid connection
    d) Welded connection

78. What is the main advantage of using high-strength steel in structural design?
    a) Reduced material cost
    b) Increased ductility
    c) Higher load-carrying capacity with reduced member sizes
    d) Lower fabrication cost

79. What is the significance of the term "compact section" in steel design?
    a) It refers to a steel section that is designed for optimal material usage.
    b) It indicates a section that is efficient in resisting bending and shear stresses.
    c) It denotes a section that is slender and prone to buckling under compression.
    d) It signifies a steel section that is resistant to fatigue failure.

80. What is the primary advantage of using built-up sections in steel structures?
    a) Enhanced corrosion resistance
    b) Increased structural stiffness
    c) Greater design flexibility
    d) Reduced fabrication complexity

81. What role do shear connectors play in composite steel-concrete structures?
    a) They improve the fire resistance of the structure.
    b) They provide a mechanical connection between steel beams and concrete slabs.
    c) They enhance the aesthetic appeal of the structure.
    d) They increase the overall structural damping coefficient.

82. What is the purpose of a Bill of Quantities (BOQ) in construction projects?
    a) To provide a detailed breakdown of project costs
    b) To specify the quality of materials required
    c) To estimate the time required for project completion
    d) To outline the project management plan

83. What does the term "analysis of rates" refer to in construction estimating?
    a) Evaluating the market rates for construction materials
    b) Analyzing the productivity of labour on site
    c) Calculating the cost per unit of construction work
    d) Assessing the depreciation rates of construction equipment

84. In the context of construction contracts, what does the term "variation" refer to?
    a) Changes to the project design or scope of work
    b) Fluctuations in market prices of construction materials
    c) Variability in labor productivity
    d) Deviations from safety regulations

85. What is the purpose of contour lines in surveying?
    a) To represent the elevation of the land surface
    b) To indicate the property boundaries
    c) To mark the locations of utility lines
    d) To show the vegetation cover

86. In highway design, what is the purpose of a vertical curve?
    a) To provide a smooth transition between different gradients
    b) To accommodate changes in road width
    c) To facilitate drainage
    d) To control traffic speed

87. What is the primary objective of highway geometric design?
   a) To minimize construction costs
   b) To maximize vehicle speed and safety
   c) To enhance aesthetic appeal
   d) To minimize environmental impact

88. The intensity-duration-frequency curves for precipitation indicate that:
   a) The greater the intensity of rainfall the shorter length of time it continues
   b) The days on which rainfall occurs at a location
   c) Cumulative rainfall over a period with frequency of periodicpeaks, is ultimately constant
   d) The intensity of rainfall increases as the duration increase

89. Which of the following factors affect Manings rugosity coefficient in open channel flow?
   a) Channel bed material
   b) Channel slope
   c) Shape of channel
   d) All of the above

90. Which Model law is applicable for a river model?
   a) Froude Model Law
   b) Reynolds Model Law
   c) Weber Model Law
   d) None of the above

91. Which of the following methods can be used for flood estimation?
   a) Gumbel Method
   b) Chows Frequency Factor Method
   c) Unit Hydrograph Method
   d) All of the above

92. Which of the following statement(s) is/are correct related to Orographic rainfall?
   a) Orographic rainfall happens evenly on both sides of a mountain.
   b) Leeward region faces less rainfall than windward region.
   c) There is no cloud formation in Orographic rainfall.
   d) Windward region faces less rainfall than leeward region.

93. River Meandering typically occurs in:
   a) Upper river reach
   b) Middle river reach
   c) Lower river reach
   d) Nond of the above

94. Silt factor depends on:
    a) D_{50}
    b) D_{60}
    c) D_{40}
    d) D_{20}

95. Loss of water from plants and trees is called:
    a) Percolation
    b) Transpiration
    c) Infiltration
    d) Hydration

96. The number of rain gauges per unit area to give fairly reliable data on rainfall over an area is:
    a) Small where rainfall gradient is steep
    b) Large where rainfall gradient is steep
    c) Small for hilly area
    d) Large for level terrain

97. Which of the following is **NOT** a hydro-meteorological factor influencing the surface run-off and characteristics of stream flow?
    a) Precipitation
    b) Vegetation cover
    c) Evapo-transpiration
    d) Air temperature and humidity

98. A hydrograph is a plot of:
    a) Precipitation against time
    b) Stream flow against time
    c) Surface run-off against time
    d) Recorded run-off against time

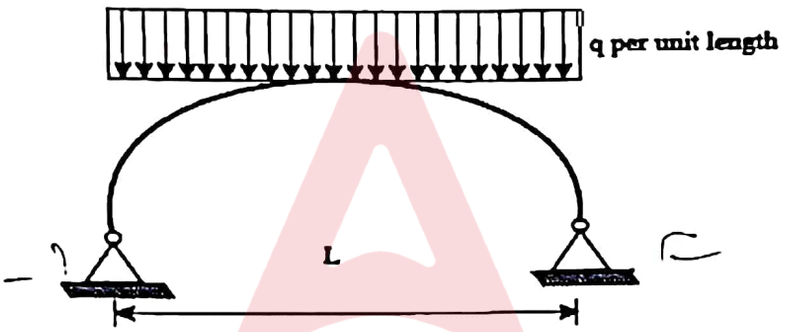
99. A double mass curve of rain is a plot between:
    a) The total annual rainfall at a station and the total annual rainfall of the previous year
    b) The total annual rainfall at a station and the total annual rainfall at a neighbouring station
    c) The cumulative total annual rainfall at a station and the cumulative annual rainfall at a number of nearby stations
    d) The actual rainfall and the cumulative rainfall

100. The movement of water in a channel is influenced by:
    a) Force of gravity
    b) Slope
    c) Friction of water with channel bed
    d) All of the above

101. The flow in an open channel is called steady if:
   a) The channel always runs full
   b) The velocity of fluid remains constant with respect to time
   c) The discharge remains maximum
   d) None of the above

102. An aggrading river is:
   a) Scouring
   b) Silting
   c) Scouring and Silting
   d) None of the above

103. The figure shows a two-hinged parabolic arch of span L subjected to a uniformly distributed load of intensity q per unit length.



The maximum bending moment in the arch is equal to:
   a) qL^2/8
   b) qL^2/12
   c) Zero
   d) qL^2/10

104. The number of simultaneous equations to be solved in the slope deflection method is equal to:
   a) Static indeterminacy
   b) Kinematic indeterminacy
   c) Number of joint displacements in the structure
   d) None of the above

105. In a fillet weld, the direct shear stress and bending tensile stress are 50 MPa and 150 MPa, respectively. As per IS 800: 2007, the equivalent stress (in MPa) will be:
   a) 173.21 MPa
   b) 180.00 MPa
   c) 160.00 MPa
   d) 200.00 MPa

106. The deformation in concrete due to sustained loading is:
   a) Creep
   b) Hydration
   c) Segregation
   d) Shrinkage

107. Two rectangular under-reinforced concrete beam sections X and Y are similar in all aspects except that the longitudinal compression reinforcement in section Y is 10% more. Which of the following is the correct statement?
   a) Section X has less flexural strength and is less ductile than section Y.
   b) Section X has less flexural strength but is more ductile than section Y.
   c) Sections X and Y have equal flexural strength but different ductility.
   d) Sections X and Y have equal flexural strength and ductility.

108. As per IS 456: 2000, the minimum percentage of tension reinforcement (up to decimal places) required in reinforced-concrete beams of rectangular cross-section (considering effective depth in the calculation of area) using Fe500 grade steel is:
   a) 0.15%
   b) 0.17%
   c) 0.19%
   d) None of the above

109. The maximum ratio of span to the depth of a slab simply supported and spanning in one direction, is:
   a) 35
   b) 25
   c) 30
   d) 20

110. Lapped splices in tensile reinforcement are generally not used for bars of size larger than:
   a) 18 mm diameter
   b) 24 mm diameter
   c) 30 mm diameter
   d) 36 mm diameter

111. A pre-stressed concrete member is preferred because:
   a) Its dimensions are not decided from the diagonal tensile stress
   b) Large size of long beams carrying large shear force need not be adopted
   c) Removal of cracks in the members due to shrinkage
   d) All of the above

112. Columns may be made of plain concrete if their unsupported lengths do not exceed their least lateral dimension:
   a) Two times
   b) Three times
   c) Four times
   d) Five times

113. The forces acting on the web splice of a plate girder are:
   a) Axial forces
   b) Shear and axial forces
   c) Shear and bending forces
   d) Axial and bending forces

114. Rivets connecting flange angles to cover plates in a plate girder are subjected to:
   a) Horizontal shear only
   b) Vertical load only
   c) Both (a) and (b)
   d) None of the above

115. Shear buckling of web in a plate girder is prevented by using:
   a) Vertical intermediate stiffener
   b) Horizontal stiffener at neutral axis
   c) Bearing stiffener
   d) None of the above

116. Compression members composed of two channels back-to-back and separated by a small distance are connected by riveting so that the minimum slenderness ratio of each member between the connections, does not exceed:
   a) 40
   b) 50
   c) 60
   d) 70

117. The heaviest I-section for same depth is:
   a) ISMB
   b) ISLB
   c) ISHB
   d) ISWB

118. The effective length of a compression member of length L held in position and restrained in direction at one end and effectively restrained in direction but not held in position at the other end is:
   a) L
   b) 0.67 L
   c) 0.85 L
   d) 1.5 L

119. Bearing stiffeners are provided at:
   i. The supports
   ii. The mid span
   iii. The point of application of concentrated loads

   a) Only (i)
   b) Both (i) and (ii)
   c) Both (i) and (iii)
   d) (i), (ii) and (iii)

120. The amount of reinforcement for main bars in a slab is based upon:
   a) Minimum bending moment
   b) Maximum bending moment
   c) Maximum shear force
   d) Minimum shear force

121. In a particular material, if the modulus of rigidity is equal to the bulk modulus, then the Poisson's ratio will be:
   a) 1/8
   b) ¼
   c) ½
   d) 1

122. In the theory of plastic bending of beams, the ratio of plastic moment to yield moment is called:
   a) Shape factor
   b) Plastic section modulus
   c) Modulus of resilience
   d) Rigidity modulus

123. The unit load method used in structural analysis is:
   a) Applicable only to statically indeterminate structures
   b) Another name for stiffness method
   c) An extension of Maxwell's reciprocal method
   d) Derived from Castigliano's method

124. In a linear elastic structural element:
   a) Stiffness is directly proportional to flexibility.
   b) Stiffness is inversely proportional to flexibility.
   c) Stiffness is equal to flexibility.
   d) Stiffness and flexibility are not related.

125. A single bay portal frame of height '*h*' fixed at the base is subjected to a horizontal displacement 'δ' at the top. The base moments developed is proportional to ____, where '*I*' is the moment of inertia of the cross-section.

a) I/h
b) I/h^2
c) I/h^3
d) None of the above