300+ TOP Design of Steel Structures Objective Questions and Answers

Design of Steel Structures Questions :-

1. The heaviest I-section for same depth is

a) ISMB
b) ISLB
c) ISHB
d) ISWB
Ans: c

2. Bending compressive and tensile stresses respectively are calculated based on

a) net area and gross area
b) gross area and net area

c) net area in both cases
d) gross area in both cases
Ans: b

3. If the thickness of thinnest outside plate is 10 mm, then the maximum pitch of rivets in tension will be taken as
a) 120 mm
b) 160 mm
c) 200 mm
d) 300 mm
Ans: b

4. In a gusseted base, when the end of the column is machined for complete bearing on the base plate, then the axial load is assumed to be transferred to base plate
a) fully by direct bearing
b) fully through fastenings
c) 50% by direct bearing and 50% through fastenings
d) 75% by direct bearing and 25% through fastenings
Ans: c

5. When the axis of load lies in the plane of rivet group, then the rivets are subjected to
a) only shear stresses
b) only tensile stresses
c) both (a) and (b)
d) none of the above
Ans: a

6. When the axis of load lies in the plane of rivet group, then the most heavily loaded rivet will be the one which

a) is at the maximum distance from CG of the rivet group
b) is at the minimum distance from CG of the rivet group
c) gives the maximum angle between the two forces Fa and Fm
d) gives the minimum angle between the two forces Fa and Fm
where, Fa is the load shared by each rivet due to axial load and Fm is the shearing load due to moment in any rivet.
Ans: d

7. Which of the following types of riveted joint is free from bending stresses ?

a) lap joint
b) butt joint with single cover plate
c) butt joint with double cover plates
d) none of the above
Ans: c

8. The difference between gross diameter and nominal diameter for the rivets up to 25 mm diameter is

a) 1.0 mm
b) 1.5 mm
c) 2.0 mm
d) 2.5 mm
Ans: b

9. As compared to field rivets, the shop rivets are

a) stronger
b) weaker
c) equally strong

d) any of the above
Ans: a

10. If the thickness of plate to be connected by a rivet is 16 mm, then suitable size of rivet as per Unwin's formula will be
a) 16 mm
b) 20 mm
c) 24 mm
d) 27 mm
Ans: c

11. By providing sufficient edge distance, which of the following failures of riveted joint can be avoided ?
a) tension failure of the plate
b) shear failure of the rivet
c) shear failure of the plate
d) crushing failure of the rivet
Ans: c

12. Minimum pitch of the rivets shall not be less than
a) 1.5 d
b) 2.0 d
c) 2.5 d
d) 3.0 d
where d is gross diameter of rivet
Ans: c

13. Efficiency of a riveted joint, having the minimum pitch as per IS : 800, is
a) 40%
b) 50%
c) 60%
d) 70%
Ans: c

14. Select the correct statement

a) Material cost of a rivet is higher than that of a bolt.
b) Tensile strength of a bolt is lesser than that of a rivet.
c) Bolts are used as a temporary fastenings whereas rivets are used as permanent fastenings.
d) Riveting is less noisy than bolting.
Ans: c

15. Bolts are most suitable to carry

a) shear
b) bending
c) axial tension
d) shear and bending
Ans: c

16. Diameter of a bolt hole is usually taken as

a) gross diameter of bolt
b) nominal diameter + 1.5 mm
c) nominal diameter + 2.0 mm
d) nominal diameter of bolt
Ans: b

17. When the bolts are subjected to reversal of stresses, the most suitable type of bolt is

a) black bolt
b) ordinary unfinished bolt
c) turned and fitted bolt
d) high strength bolt
Ans: d

18. In the cross-section of a weld, throat is the
a) minimum dimension
b) average dimension
c) maximum dimension
d) none of the above
Ans: a

19. The effective length of a fillet weld should not be less than
a) two times the weld size
b) four times the weld size
c) six times the weld size
d) weld size
Ans: b

20. For a standard 45° fillet, the ratio of size of fillet to throat thickness is
a) 1:1
b) 1 : V2
c) V2 : 1
d) 2: 1
Ans: c

21. A butt weld is specified by
a) effective throat thickness
b) plate thickness
c) size of weld
d) penetration thickness
Ans: a

22. The actual thickness of butt weld as compared to the thickness of plate is usually
a) more
b) less
c) equal
d) none of the above
Ans: a

23. According to IS Specifications, the maximum pitch of rivets in compression is
a) lesser of 200 mm and 12 t

b) lesser of 200 mm and 161
c) lesser of 300 mm and 32 t
d) lesser of 3 00 mm and 24 t
where t is thickness of thinnest outside plate or angle
Ans: a

24. A circular column section is generally not used in actual practice because
a) it is uneconomical
b) it cannot carry the load safely
c) it is difficult to connect beams to the round sections
d) all of the above
Ans: c

25. The slenderness ratio of a column supported throughout its length by a masonry wall is
a) zero
b) 10
c) 100
d) infinity
Ans: a

26. According to IS Specifications, the effective length of a column effectively held in position at both ends and restrained in direction at one end is taken as
a) 0.67 L
b) 0.8 L
c) L
d) 1.5 L
Ans: b

27. The effective length of a battened strut effectively held in position at both ends but not restrained in direction is taken as
a) 1.8 L
b) L
c) 1.1 L
d) 1.5 L
Ans: c

28. The maximum slenderness ratio of a compression member carrying both dead and superimposed load is

a) 180
b) 200
c) 250
d) 350
Ans: a

29. The maximum slenderness ratio of a steel column, the design of which is governed by wind or seismic forces is

a) 150
b) 180
c) 250
d) 350
Ans: c

30. According to IS:800, in the Merchant Rankine formula the value of imperfection index (n) is

a) 1.0
b) 1.4
c) 1.8
d) 2.0
Ans: b

31. The best arrangement to provide unified behaviour in built up steel columns is by

a) lacing
b) battening
c) tie plates
d) perforated cover plates
Ans: a

32. If the 20 mm rivets are used in lacing bars, then the minimum width of lacing bar should be

a) 40mm
b) 60mm
c) 80mm
d) 100mm
Ans: b

33. The use of tie plates in laced columns is
a) prohibited
b) not prohibited
c) permitted at start and end of lacing system only
d) permitted between two parts of the lacing
Ans: c

34. Lacing bars in a steel column should be designed to resist
a) bending moment due to 2.5% of the column load
b) shear force due to 2.5% of the column load
c) 2.5% of the column load
d) both (a) and (b)
Ans: b

35. Angle of inclination of the lacing bar with the longitudinal axis of the column should preferably be between
a) 10° to 30°
b) 30° to 40°
c) 40° to 70°
d) 90°
Ans: c

36. Battening is preferable when the
i) column carries axial load only
ii) space between the two main components is not very large
iii) column is eccentrically loaded The correct answer is
a) only (i)
b) only (iii)
c) (i) and (ii)
d) (ii) and (iii)
Ans: c

37. The effective length of a battened column is increased by
a) 5%
b) 10%
c) 15%

d) 20%
Ans: b

38. The overlap of batten plates with the main members in welded connections should be more than
a) 3t
b) 4t
c) 6t
d) 8t
where t = thickness of the batten plate
Ans: b

39. The slenderness ratio of lacing bars should not exceed
a) 100
b) 120
c) 145
d) 180
Ans: c

40. Economical depth of a plate girder corresponds to
a) minimum weight
b) minimum depth
c) maximum weight
d) minimum thickness of web
Ans: a

41. 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
Ans: a

42. Horizontal stiffener in a plate girder is provided to safeguard against
a) shear buckling of web plate
b) compression buckling of web plate
c) yielding
d) all of the above
Ans: b

43. Minimum thickness of web in a plate girder, when the plate is accessible and also exposed to weather, is

a) 5 mm
b) 6 mm
c) 8 mm
d) 10 mm
Ans: b

44. The web crippling due to excessive bearing stress can be avoided by

a) increasing the web thickness
b) providing suitable stiffeners
c) increasing the length of the bearing plates
d) none of the above
Ans: c

45. As per IS : 800, for compression flange, the outstand of flange plates should not exceed

a) 121
b) 161
c) 201
d) 251
where t = thickness of thinnest flange plate
Ans: b

46. Intermediate vertical stiffeners in a plate girder need be provided if the depth of web exceeds

a) 501
b) 851
c) 200 t
d) 2501
where t is thickness of web
Ans: b

47. Bearing stiffener in a plate girder is used to

a) transfer the load from the top flange to the bottom one
b) prevent buckling of web
c) decrease the effective depth of web
d) prevent excessive deflection
Ans: b

48. 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
Ans: c

49. Gantry girders are designed to resist

a) lateral loads
b) longitudinal loads and vertical loads
c) lateral, longitudinal and vertical loads
d) lateral and longitudinal loads
Ans: c

50. Minimum spacing of vertical stiffeners is limited to

a) d/4
b) d/3
c) d/2
d) 2d/3
where d is the distance between flange angles
Ans: b

51. Bearing stiffeners are provided at
i) the supports
ii) the mid span
iii) the point of application of concentrated loads The correct answer is

a) only (i)
b) both (i) and (ii)
c) both (i) and (iii)
d) (i), (ii) and (iii)
Ans: c

52. 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
Ans: a

53. The maximum spacing of vertical stiffeners is

a) 1.33 d

b) 1.25 d

c) 1.5 d

d) 1.75 d

where d is the distance between flange angles

Ans: c

54. The range of economical spacing of trusses varies from

a) L/3 to L/5

b) L/4to2L/5

c) L/3 to L/2

d) 2L/5 to 3L/5 where L is span

Ans: a

55. The maximum permissible span of asbestos cement sheets is

a) 650 mm

b) 810 mm

c) 1250 mm

d) 1680 mm

Ans: d

56. Normally, the angle of roof truss with asbestos sheets should not be less than

a) 26'/2°

b) 30°

c) 35°

d) 40°

Ans: b

57. To minimize the total cost of a roof truss, the ratio of the cost of truss to the cost of purlins shall be

a) 1

b) 2

c) 3

d) 4

Ans: b

58. Generally the purlins are placed at the panel points so as to avoid

a) axial force in rafter
b) shear force in rafter
c) deflection of rafter
d) bending moment in rafter
Ans: d

59. For the buildings having a low permeability, the internal wind pressure acting normal to the wall and roof surfaces is taken as

a) zero
b) ±0.2p
c) ± 0.5 p
d) ±0.7p
where p is basic wind pressure
Ans: b

60. The relation between intensity of wind pressure p and velocity of wind V is taken as

a) pa V
b) paV2
c) p a (1/V)
d) paV”2
Ans: b

Design of Steel Structures Interview Questions

61. The live load for a sloping roof with slope 15°, where access is not provided to roof, is taken as

a) 0.65 kN/m2
b) 0.75 kN/m2
c) 1.35 kN/m2
d) 1.50 kN/m2
Ans: a

62. The internal pressure coefficient on walls for buildings with large permeability is taken as

a) ± 0.2
b) ±0.5
c) ± 0.7

d) 0
Ans: c

63. The basic wind speed is specified at a height 'h' above mean ground level in an open terrain. The value of'h' is
a) 10 m
b) 20 m
c) 25 m
d) 50 m
Ans: a

64. The risk coefficient k, depends on
a) mean probable design life of structures
b) basic wind speed
c) both (a) and (b)
d) none of the above
Ans: c

65. The external wind pressure acting on a roof depends on
a) degree of permeability of roof
b) slope of roof
c) both (a) and (b)
d) none of the above
Ans: b

66. Area of openings for buildings of large permeability is more than
a) 10% of wall area
b) 20% of wall area
c) 30% of wall area
d) 50% of wall area
Ans: b

67. As per IS : 875, for the purposes of specifying basic wind velocity, the country has been divided into
a) 4 zones
b) 5 zones
c) 6 zones
d) 7 zones
Ans: c

68. The number of seismic zones in which the country has been divided are

a) 3
b) 5
c) 6
d) 7
Ans: b

69. Minimum pitch provided in riveted steel tanks is

a) 1.5 d
b) 2.0 d
c) 2.5 d
d) 3.0 d
where d is diameter of rivets
Ans: d

70. The allowable tensile stress in structural mild steel plates for steel tank is assumed as

a) 95.0 MPa on net area
b) 105.5 MPa on net area
c) 105.5 MPa on gross area
d) 150.0 MPa on gross area
Ans: b

71. Steel tanks are mainly designed for

a) weight of tank
b) wind pressure
c) water pressure
d) earthquake forces
Ans: c

72. Which of the following sections should preferably be used at places where torsion occurs ?

a) angle section
b) channel section
c) box type section
d) any of the above
Ans: c

73. The capacity of the smallest pressed steel tank is

a) 1000 litre

b) 1650 litre
c) 1950 litre
d) 2450 litre
Ans: c

74. The bracing between two columns of a steel tank will be designed to resist
a) horizontal shear due to wind or earthquake only
b) horizontal, shear due to wind or earthquake + 2.5% of column loads
c) column loads + 2.5% of horizontal shear due to wind or earthquake
d) column loads + full horizontal shear due to wind or earthquake
Ans: b

75. The minimum thickness of plates in a steel stack should be
a) 4 mm
b) 5 mm
c) 6 mm
d) 8 mm
Ans: c

76. Maximum pitch of rivets, used in steel stacks, is limited to
a) 6t
b) 101
c) 121
d) 161
where t is thickness of thinner plate being connected
Ans: b

77. The diameter of base of conical flare of a steel stack is
a) less than d
b) equal to d
c) more than d
d) any of the above
where d is the diameter of the cylindrical part
Ans: c

78. Hudson's formula gives the dead weight of a truss bridge as a function of

a) bottom chord area
b) top chord area
c) effective span of bridge
d) heaviest axle load of engine
Ans: a

79. If the loaded length of span in meters of a railway steel bridge carrying a single track is 6 m, then impact factor is taken as

a) 0
b) 0.5
c) between 0.5 and 1.0
d) 1.0
Ans: c

80. If the floor is supported at or near the bottom but top chords of a bridge are not braced, then the bridge is called

a) deck type
b) through type
c) half through type
d) double deck type
Ans: c

81. The centrifugal force due to curvature of track is assumed to act on the bridge at a height of

a) 1.23 m above the rail level
b) 1.50 m above the rail level
c) 1.83 m above the rail level
d) 2.13 m above the rail level
Ans: c

82. The effect of racking forces is considered in the design of

i) lateral braces
ii) chord members
The correct answer is
a) only (i)
b) only (ii)

c) both (i) and (ii)
d) none of the above
Ans: a

83. The portal bracing in a truss bridge is used to
a) transfer load from top of end posts to bearings
b) keep the rectangular shape of the bridge cross-section
c) stiffen the structure laterally
d) prevent the sidesway buckling of top chord
Ans: a

84. The sway bracing is designed to transfer
a) 2Vi % of the top panel wind load to bottom bracing
b) 10% of the top panel wind load to bottom bracing
c) 25% of the top panel wind load to bottom bracing
d) 50% of the top panel wind load to bottom bracing
Ans: d

85. Study the following statements.
i) Top lateral bracing prevents the sidesway buckling of the chord.
ii) Sway bracing keeps the rectangular shape of the bridge cross-section.
iii) Sway bracing transfers the load from top of end posts to bearings.
The correct answer is
a) only (i)
b) both (i) and (ii)
c) both (i) and (iii)
d) all (i), (ii) and (iii)
Ans: b

86. The bracing provided in the plane of end posts is called
a) sway bracing
b) portal bracing
c) top lateral bracing
d) bottom lateral bracing
Ans: b

87. compression force in two end posts The pin of a rocker bearing in a bridge is designed for

a) bearing and shear
b) bending and shear
c) bearing and bending
d) bearing, shear and bending
Ans: d

88. The least dimension in case of a circular column of diameter D is taken as
a) 0.5 D
b) 0.68 D
c) 0.88 D
d) D
Ans: c

89. In case of timber structures, the form factor for solid circular cross-section is taken as
a) 1.18
b) 1.414
c) 1.67
d) 1.81
Ans: a

90. In case of timber structures, the simple bending formula M = fz may be applied for
a) rectangular beams up to 300 mm depth
b) all rectangular beams
c) solid circular beams only
d) all square cross-section beams
Ans: a

91. The elastic strain for steel is about
a) 1/12 of strain at the initiation of strain hardening and about 1/120 of maxi-mum strain
b) 1/2 of strain at the initiation of strain hardening and about 1/12 of maxi-mum strain
c) 1/12 of strain at the initiation of strain hardening and 1/200 of maximum strain
d) 1/24 of strain at the initiation of strain hardening and about 1/200 of maximum strain
Ans: c

92. The mechanism method and the statical method give
a) lower and upper bounds respectively on the strength of structure
b) upper and lower bounds respectively on the strength of structure
c) lower bound on the strength of structure
d) upper bound on the strength of structure
Ans: b

93. The moment-curvature relation at a plastic hinge is
a) linear
b) parabolic
c) constant moment for all curvatures
d) constant curvature for all moments
Ans: c

94. Shape factor is a property which depends
a) only on the ultimate stress of the material
b) only on the yield stress of the material
c) only on the geometry of the section
d) both on the yield stress and ultimate stress of material
Ans: c

95. The statical method of plastic analysis satisfies
a) equilibrium and mechanism conditions
b) equilibrium and plastic moment conditions
c) mechanism and plastic moment conditions
d) equilibrium condition only
Ans: b

96. The mechanism method of plastic analysis satisfies
a) equilibrium and mechanism conditions
b) equilibrium and plastic moment conditions
c) mechanism and plastic moment conditions
d) equilibrium condition only
Ans: a

97. Load factor is
a) always equal to factor of safety
b) always less than factor of safety
c) always greater than factor of safety
d) sometimes greater than factor of safety
Ans: c

98. The ratio of plastic section modulus to elastic section modulus

a) is equal to 1
b) is always less than 1
c) is always greater than 1
d) can be less than 1
Ans: c

99. Other conditions being same, the load factor in indeterminate structures is

a) equal to load factor in determinate structures
b) more than the load factor in determinate structures
c) less than the load factor in determinate structures
d) unpredictable
Ans: b

100. Which of the following conditions is to be satisfied both in elastic and plastic analysis ?

a) equilibrium condition
b) yield condition
c) plastic moment condition
d) mechanism condition
Ans: a

101. In the virtual work method, the virtual quantity is

a) displacement
b) load
c) slope
d) moment
Ans: a

102. As per IS:800, in the plastic design, which of the following pairs are correctly matched?
Working Loads Load factor
(i) Dead load 1.7
(ii) Dead Load + imposed load 1.7
(iii) Dead load + load due to wind or 1.3 seismic forces
(iv) Dead load + imposed load + load 1.7
due to wind or seismic forces Of these statements

a) (i) and (ii) are correct
b) (i), (ii) and (iii) are correct

c) (ii) and (iii) are correct
d) only (i) is correct
Ans: a

103. The shape factor of an isosceles triangle for bending about the axis parallel to the base is:
a) 1.5
b) 1.7
c) 2.0
d) 2.34
Ans: d

104. In case of plastic design, the calculated maximum shear capacity of a beam as per IS:800 shall be
a) 0.55 Awfy
b) 0.65 Awfy
c) 0.75 Awfy
d) 0.85 Awfy
where, Aw = effective cross-sectional area resisting shear fy = yield stress of the steel
Ans: a

105. The minimum thickness of a steel plate, which is directly exposed to weather and is not accessible for cleaning and repainting, should be:
a) 4.5 mm
b) 6 mm
c) 8 mm
d) 10 mm
Ans: c

106. The moment of inertia of the pair of vertical stiffeners about the center line of the web should not be less than.
a) 1.5dV/C
b) 1.5d¥/C
c) 1.5d¥/C2
d) 1.5dY/C3
where, 't' is the minimum required thick-ness of the web and 'C is the maximum permitted clear distance between vertical stiffener for

thickness ‘t’.
Ans: c

107. The connection of intermediate vertical stiffeners to the web, not subjected to external loads, shall be designed for a minimum shear force (kN/m) of
a) 75 t2/h
b) 125 t3/h2
c) 125 t2/h
d) 175 t2/h
where, t = the web thickness in mm
h = the outstand of stiffener in mm
Ans: c

108. For a compression member with double angle section, which of the following section will give larger value of minimum radius of gyration?
a) equal angles back to back
b) unqual legged angles with long legs back to back
c) unequal legged angles with short legs back to back
d) both (b) or (c)
Ans: b

109. Lug angles
a) are used to reduce the length of connection.
b) are unequal angles.
c) increases shear lag.
d) all the above
Ans: a

110. For rivets in tension with counter-sunk heads, the tensile value shall be
a) reduced by 25 %
b) reduced by 33.3%
c) increased by 25 %
d) increased by 33.3 %
Ans: b

111. A steel beam supporting loads from the floor slab as well as from wall is termed as
a) stringer beam

b) lintel beam
c) spandrel beam
d) header beam
Ans: c

112. Pitch of tacking rivets, when double angles connected back to back and acting as tension members should not be more than
a) 500 mm
b) 600 mm
c) 1000 mm
d) 300 mm
Ans: c

113. In moment resistant connections, the moment resistance of riveted connection depends upon
a) shear in rivets
b) compression in rivets
c) tension in rivets
d) strength of rivets in bearing
Ans: c

120. The allowable shear stress in the web of mild steel beams decreases with
a) decrease in h/t ratio
b) increase in h/t ratio
c) decrease in thickness
d) increase in height
where 'h' is height and t is thickness
Ans: b

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