

## ANSWERS

### EXERCISE - I

1. (a)	2. (a)	3. (b)	4. (a)	5. (d)	6. (a)	7. (d)	8. (d)	9. (b)	10. (c)
11. (d)	12. (c)	13. (a)	14. (a)	15. (c)	16. (d)	17. (b)	18. (a)	19. (c)	20. (c)
21. (b)	22. (c)	23. (d)	24. (b)	25. (a)	26. (a)	27. (b)	28. (d)	29. (d)	30. (a)
31. (b)	32. (a)	33. (c)	34. (c)	35. (b)	36. (d)	37. (a)	38. (d)	39. (b)	40. (b)
41. (d)	42. (d)	43. (a)	44. (d)	45. (c)	46. (c)	47. (d)	48. (b)	49. (b)	50. (b)
51. (a)	52. (a)	53. (a)	54. (a)	55. (d)	56. (b)	57. (b)	58. (b)	59. (d)	60. (c)
61. (a)	62. (b)	63. (b)	64. (c)	65. (c)	66. (d)	67. (b)	68. (b)	69. (b)	70. (c)
71. (a)	72. (c)	73. (d)	74. (d)	75. (c)	76. (a)	77. (b)	78. (a)	79. (d)	80. (a)
81. (a)	82. (c)	83. (b)	84. (c)	85. (b)	86. (d)	87. (b)	88. (b)	89. (a)	90. (a)
91. (b)	92. (c)	93. (b)	94. (b)	95. (d)	96. (b)	97. (d)	98. (d)	99. (b)	100. (b)
101. (b)	102. (b)	103. (d)	104. (a)	105. (c)	106. (a)	107. (d)	108. (d)	109. (b)	110. (b)
111. (c)	112. (b)	113. (c)	114. (a)	115. (b)	116. (b)	117. (b)	118. (c)	119. (d)	120. (b)
121. (c)	122. (b)	123. (c)	124. (d)	125. (c)	126. (d)	127. (c)	128. (a)	129. (d)	130. (b)
131. (b)	132. (c)	133. (b)	134. (b)	135. (c)	136. (c)	137. (d)			

### EXERCISE - II

1. (c)	2. (b)	3. (a)	4. (*)	5. (c)	6. (c)	7. (c)	8. (a)	9. (b)	10. (d)
11. (b)	12. (a)	13. (b)	14. (c)	15. (c)	16. (a)	17. (b)	18. (c)	19. (c)	20. (a)
21. (a)	22. (b)	23. (a)	24. (b)	25. (b)	26. (d)	27. (d)	28. (b)	29. (a)	30. (c)
31. (a)	32. (b)	33. (d)	34. (b)	35. (d)	36. (a)	37. (b)	38. (b)	39. (c)	40. (a)
41. (b)	42. (b)	43. (*)	44. (b)	45. (a)	46. (c)	47. (c)	48. (d)	49. (a)	50. (b)
51. (c)	52. (a)	53. (*)	54. (d)						

## EXPLANATIONS

### EXERCISE - II

- The columns which have their lengths varying from 8 times their diameter to 30 times their respective diameters or their slenderness ratio lying between 32 and 120 is classified under Medium column.

$$2. \quad \eta = \frac{P_t}{P} = \frac{(p-d)t\sigma_{at}}{pt\sigma_{at}} = \frac{p-d}{p}$$

- A column splice is used to increase length of the column.

- Effective throat thickness (t) and size of weld (S) are connected as  $t = kS$ .

- Bolts are most suitable to carry axial tension.

- Strength of rivet in bearing =  $\sigma_b \cdot d \cdot t$

This is applicable for single riveted joint. If, however there are n rows of rivets per pitch length, we have strength of rivet in bearing =  $(p-d] t \cdot \sigma_b$

And strength of rivet in shearing =  $n \cdot \frac{\pi}{4} d^2 \sigma_s$   
for single shear

$$= 2n \cdot \frac{\pi}{4} d^2 \sigma_s \text{ for double shear}$$

### 9. Assumptions in Riveted Connection

- Friction between the plates is neglected.
- Initial tensile stress in the rivet is neglected.
- The plates are rigid.
- The rivet fills the hole completely.
- Deformation of the plates under the load is neglected.
- Shearing deformation of the rivets is assumed proportional to the shearing stress.
- Shearing stress in the rivet is assumed to be uniformly distributed over the rivet cross-section.
- Unit shearing stress in all the rivets of a joint is uniform.
- Tensile stress concentration due to rivet holes in the plates is neglected.
- Bearing stress between rivets and plates is assumed to be uniformly distributed over the nominal contact surface between the rivets and plates.
- Bending of rivets is neglected.



## 12.46 Steel Design

20.  $0.00618 d^2$

If  $d$  in mm,

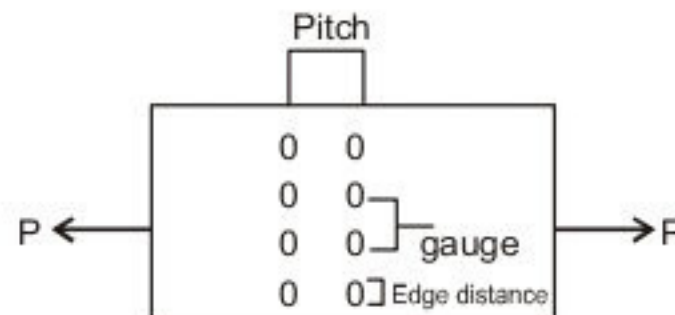
weight of steel bar =  $7.85 \times 10^{-3} \times \frac{\pi}{4} \times d^2 \text{ kg/m}$

21. Springs joined in series

$$\frac{1}{S} = \frac{1}{S_1} + \frac{1}{S_2} = \frac{S_1 + S_2}{S_1 S_2}$$

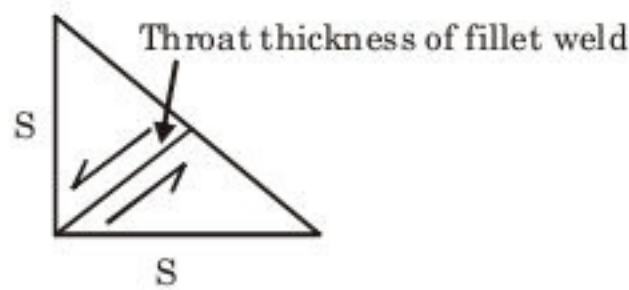
$$S \Rightarrow \frac{S_1 S_2}{S_1 + S_2}$$

22. Gauge



23. 1.5 mm less than the thickness of plate

25. The size of a fillet weld ( $S$ ) depends on side of the triangle of fillet.



26. For bars in compression, the values of bond stress for bars in tension shall be increased by 25 percent.

27. Slenderness ( $\lambda$ ) =  $\frac{l_{\text{eff}}}{r_{\text{min}}}$

Now, radius of gyration,

$$r = \sqrt{\frac{I}{a}} = \sqrt{\frac{\frac{\pi}{64} \times D^4}{\frac{\pi}{4} \times D^2}} = \sqrt{\frac{D^4}{16D^2}} = \frac{D}{4}$$

Hence slenderness,

$$\lambda = \frac{l}{r} = \frac{400}{\frac{D}{4}} = \frac{400 \times 4}{40} = 40$$

28. The load factor applied to wind and seismic loads in design of steel structures is 1.3.

31. The permanent deformation of concrete with time under steady load is called creep.

33. The size of aggregate is more than 75 mm then it is known as cyclopean aggregate.

34. The centrifugal force on a car moving on a horizontal circular curve

$$P = \frac{Wv^2}{gR}$$

Where  $P$  = centrifugal force, kg

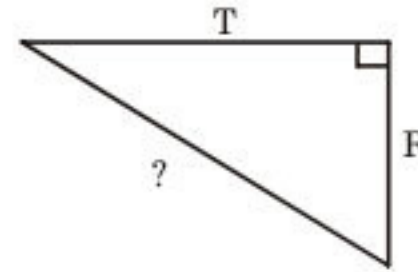
$W$  = weight of the vehicle, kg

$v$  = speed of vehicle, m/sec

35. Using straight line method annual depreciation ( $D$ )

$$D = \frac{\text{Original cost} - \text{Scrap value}}{\text{Life in year}}$$

36.



$$\text{Width of step beam} = \sqrt{R^2 + T^2}$$

37. Segregation in the concrete occurs when coarse aggregate tries to separate out from the finer material.

38. Moment of Inertia is also called the second moment of area and its unit is  $\text{mm}^4$ .

40.  $K = \frac{P}{D = 1} = \frac{Gd^4}{64R^3m}$

41.  $L + 2 \times 0.42d$

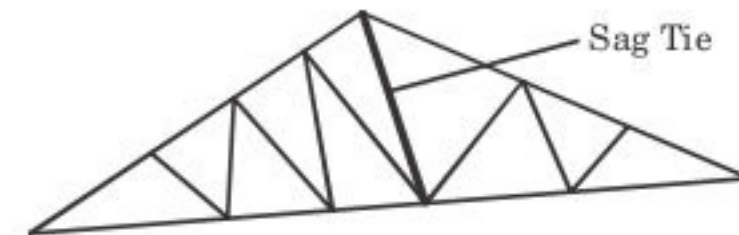
$L \Rightarrow$  effective length = clear distance.

42. As per IS : 800  $B = 3d$

44. As per IS : 456

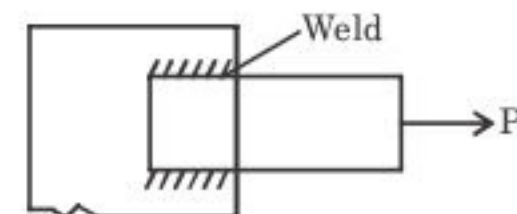
$$\Rightarrow 0.8 f_y \text{ or } \frac{f_y}{1.15} \Rightarrow \text{for steel}$$

47. A Sag Tie is a vertical member joining the Apex of truss to mid point of bottom chord.



48. The size of butt weld is specified by throat thickness which is normally the thickness of thinner plate joined by weld.

49.



50. In tension =  $32t$  or In compression =  $16t$

52. When web is crippling use bearing stiffness these are used on support and where point point.

54. Column splice is used to increase the length of the column.

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