EXAMOBJECTIVE

online preperation

II. OBJECTIVE TYPE QUESTIONS

Tick mark the most appropriate statement of the multiple choice answers:

Basic Definition

1. When a material is subjected to varying stresses, it fails under stresses considerably lower than the ultimate stress. Such type of failure of the material is known as

(*a*) creep ☐ (*b*) fatigue ☐

(*c*) stress concentration ☐ (*d*) overstrain. ☐

2. When a ductile material is loaded in excess of a certain value, a gradual increase in elongation takes place with time. This phenomenon is known as

(*a*) creep ☐ (*b*) fatigue ☐

(*c*) stress concentration ☐ (*d*) overstrain. ☐

3. When a material is subjected to varying stresses, it fails under stresses considerably lower than the ultimate stress. The magnitude of such stresses, under which the material fails, depends on

(*a*) range of stress ☐ (*b*) mean stress ☐

(*c*) number of applications ☐ (*d*) all of the above ☐

(*e*) none of the above. ☐

4. Endurance limit is the value of maximum stress which a material can withstand without failure for infinite number of cycles, when it is subjected to

(*a*) dynamic load ☐ (*b*) static load ☐

(*c*) bending load ☐ (*d*) completely reversed load. ☐

5. Figure 10.3 shows the range of stress causing failure against the number of cycles, when a material is subjected to varying stresses. The correct curve is given by

(*a*) curve *A* ☐

(*b*) curve *B* ☐

(*c*) curve *C* ☐

(*d*) curve *D*. ☐

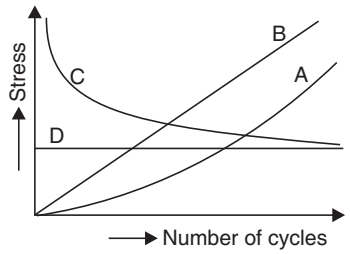

FIGURE 10.3

6. In Fig. 10.3, the endurance limit (or fatigue limit) is represented by

(*a*) curve *A* ☐ (*b*) curve *B* ☐

(*c*) curve *C* ☐ (*d*) curve *D*. ☐

7. The factor of safety, for a component subjected to fatigue loading, is given by

(*a*) $\frac{\text{Ultimate stress}}{\text{Working stress}}$ ☐ (*b*) $\frac{\text{Ultimate stress}}{\text{Endurance limit stress}}$ ☐

(*c*) $\frac{\text{Endurance limit stress}}{\text{Working stress}}$ ☐ (*d*) None of the above. ☐

8. If the size of a standard specimen is increased, the endurance limit of the material will

(*a*) increase ☐ (*b*) decrease ☐

(*c*) remain same ☐ (*d*) increase first and then decrease. ☐

9. The endurance limit of a material, subjected to fatigue loading

(*a*) increases with the increase of ultimate tensile strength ☐

(*b*) increases with the decrease of ultimate tensile strength ☐

(*c*) is independent of ultimate tensile strength ☐

(*d*) none of the above. ☐

10. Which of the following materials is having maximum ratio of the endurance limit to the ultimate tensile strength?

(*a*) cast steel ☐ (*b*) cast iron ☐

(*c*) steel ☐ (*d*) non-ferrous metals. ☐

11. Which of the following materials is having minimum ratio of the endurance limit to the ultimate tensile strength?

(*a*) cast steel ☐ (*b*) cast iron ☐

(*c*) steel ☐ (*d*) non-ferrous metals. ☐

12. The endurance limit of a material, subjected to fatigue loading

(*a*) increases with the increase of surface finish ☐

(*b*) increases with the decrease of surface finish ☐

(*c*) is independent of surface finish ☐

(*d*) none of the above. ☐

Stress Concentration Factor

13. The ratio of maximum stress in a machine component (at a notch or a fillet) to the nominal stress at the same section, is known as

(*a*) endurance limit ☐ (*b*) stress concentration factor ☐

(*c*) surface finish factor ☐ (*d*) factor of safety. ☐

14. Stress concentration factor is a function of

(*a*) geometry of the machine component ☐ (*b*) material of the machine component ☐

(*c*) geometry and material of the component ☐ (*d*) none of the above. ☐

15. Choose the wrong statement

(*a*) Stress concentration is caused due to sudden change of cross-section. ☐

(*b*) When a material is subjected to varying stresses, the material fails under stresses considerably lower than the ultimate stress. This type of failure is known as fatigue. ☐

(*c*) The ratio of endurance limit stress to working stress is known as factor of safety for a component subjected to fatigue loading. ☐

(*d*) All of the above. ☐

(*e*) None of the above. ☐

16. Choose the correct statement

(*a*) Fatigue is the failure of a material above the yield point. ☐

(*b*) For a mirror polished material, the surface finish factor is 0.5. ☐

(*c*) Stress concentration factor is independent of the geometry of the machine component. ☐

(*d*) Endurance limit of a material subjected to fatigue loading depends on the surface finish and ultimate tensile strength of the material. ☐

17. Figure 10.4 shows a plate with an elliptical hole in the centre with semi-major axis = *a* and semi-minor axis = *b*. The plate is subjected to a tensile load *P*. The maximum stress induced at the edge of the hole (*i.e.*, at point *A*) will be equal to

(*a*) $f\left(1-\frac{2a}{b}\right)$ ☐

(*b*) $f\left(1+\frac{a}{2b}\right)$ ☐

(*c*) $f\left(1-\frac{a}{2}\right)$ ☐

(*d*) $f\left(1+\frac{2a}{b}\right)$ ☐

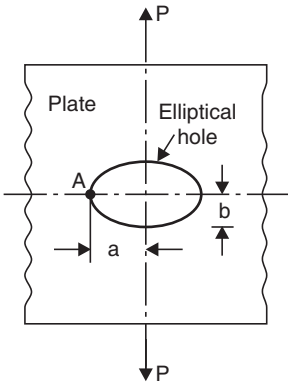

FIGURE 10.4

where *f* = Nominal stress, *i.e.*, stress in the plate far away from hole.

18. If in question 17, the ratio of a and b are changed, the stress induced at the edge of the hole (*i.e.*, at point A) will be maximum when

(*a*) $\frac{a}{b} = 0.5$ ☐ (*b*) $\frac{a}{b} = 1.0$ ☐

(*c*) $\frac{a}{b} = 1.5$ ☐ (*d*) $\frac{a}{b} = 2.0$ ☐

19. With reference to Fig. 10.4, the stress induced at the edge of the hole (*i.e.*, at point A) will be minimum when

(*a*) $\frac{a}{b} = 0.5$ ☐ (*b*) $\frac{a}{b} = 1.0$ ☐

(*c*) $\frac{a}{b} = 1.5$ ☐ (*d*) $\frac{a}{b} = 2.0$ ☐

20. If in Fig. 10.4, $\frac{a}{b} = 2.0$, then theoretical stress concentration factor will be equal to

(*a*) 2.0 ☐ (*b*) 3.0 ☐

(*c*) 4.0 ☐ (*d*) 5.0 ☐

21. If in Fig. 10.4, $\frac{a}{b} = 1.0$, then theoretical stress concentration factor will be equal to

(*a*) 2.0 ☐ (*b*) 3.0 ☐

(*c*) 4.0 ☐ (*d*) 5.0 ☐

22. If in Fig. 10.4, $\frac{a}{b} = 0.5$, then theoretical stress concentration factor will be equal to

(*a*) 2.0 ☐ (*b*) 3.0 ☐

(*c*) 4.0 ☐ (*d*) 5.0 ☐

23. Which one of the following is a wrong statement?

(*a*) Sudden change in cross-section should be avoided as they cause stress concentration. ☐

(*b*) In brittle material, stress concentration is more serious for static loading. ☐

(*c*) In cyclic loading, stress concentration is more serious in ductile materials. ☐

(*d*) Stress concentration factor is the ratio of ultimate stress to working stress. ☐

24. When the deformation of a machine number is due to bending only, the maximum bending moment is given by $M = \tau Z$ in which

(*a*) τ is the maximum shear stress and Z is polar modulus of section ☐

(*b*) τ is the maximum tensile stress and Z is modulus of section ☐

(*c*) τ is the maximum compressive stress and Z is modulus of section ☐

(*d*) τ is the maximum tensile or compressive stress and Z modulus of section. ☐

25. When the deformation of a machine member is due to pure torsion only, the maximum torque is given by $T = \tau Z$ in which

(*a*) τ is the maximum shear stress and Z is polar modulus of section ☐

(*b*) τ is the maximum tensile stress and Z modulus of section. ☐

(*c*) τ is the maximum compressive stress and Z is modulus of section ☐

(*d*) τ is the maximum tensile or compressive stress and Z modulus of section. ☐

Polar Modulus

26. For a solid shaft of diameter D, the polar modulus of section is equal to

(*a*) $\frac{\pi D^3}{64}$ ☐ (*b*) $\frac{\pi D^3}{32}$ ☐

(*c*) $\frac{\pi D^3}{16}$ ☐ (*d*) $\frac{\pi D^4}{64}$. ☐

27. For a solid shaft of diameter D, the modulus of section is equal to

(*a*) $\frac{\pi D^3}{64}$ ☐ (*b*) $\frac{\pi D^3}{32}$ ☐

(*c*) $\frac{\pi D^3}{16}$ ☐ (*d*) $\frac{\pi D^4}{64}$. ☐

28. For a solid shaft of diameter D, the moment of inertia of the section about the neutral axis is equal to

(*a*) $\frac{\pi D^3}{64}$ ☐ (*b*) $\frac{\pi D^3}{32}$ ☐

(*c*) $\frac{\pi D^3}{16}$ ☐ (*d*) $\frac{\pi D^4}{64}$. ☐

29. For a hollow shaft of external diameter D and internal diameter d, the modulus of section is equal to

(*a*) $\frac{\pi(D^4 - d^4)}{64D}$ ☐ (*b*) $\frac{\pi(D^4 - d^4)}{32D}$ ☐

(*c*) $\frac{\pi(D^4 - d^4)}{16D}$ ☐ (*d*) $\frac{\pi(D^4 - d^4)}{32D}$. ☐

30. For a hollow shaft of external diameter D and internal diameter d the polar modulus of section is equal to

(*a*) $\frac{\pi(D^4 - d^4)}{64D}$ ☐ (*b*) $\frac{\pi(D^4 - d^4)}{32D}$ ☐

(*c*) $\frac{\pi(D^4 - d^4)}{16D}$ ☐ (*d*) $\frac{\pi(D^4 - d^4)}{32D}$. ☐

31. Two direct stresses σ_1 and σ_2 are acting on a body in two mutually perpendicular planes accompanied by shear stress τ as shown in Fig. 10.5. The maximum principal stresses are given by

(*a*) $\sigma_n = \frac{\sigma_1 + \sigma_2}{2} \pm \frac{1}{2}\sqrt{(\sigma_1 - \sigma_2)^2 + 4\tau^2}$ ☐

(*b*) $\sigma_n = \frac{\sigma_1 - \sigma_2}{2} \pm \frac{1}{2}\sqrt{(\sigma_1 + \sigma_2)^2 + 4\tau^2}$ ☐

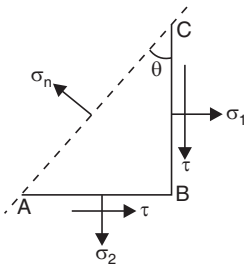

FIGURE 10.5

(*c*) $\sigma_n = \frac{\sigma_1 - \sigma_2}{2} \pm \frac{1}{2}\sqrt{(\sigma_1 - \sigma_2)^2 + 4\tau^2}$ ☐ (*d*) $\sigma_n = \frac{\sigma_1 + \sigma_2}{2} \pm \frac{1}{2}\sqrt{(\sigma_1 + \sigma_2)^2 + 4\tau^2}$. ☐

32. In question 31, the maximum principal stresses are acting on the place *AC*, which is inclined at an angle θ with the plane *BC*. The value of θ is given by the equation

(*a*) $\tan 2\theta = \frac{\sigma_1 - \sigma_2}{2\tau}$ ☐ (*b*) $\tan 2\theta = \frac{\tau}{2(\sigma_1 - \sigma_2)}$ ☐

(*c*) $\tan 2\theta = \frac{2\tau}{(\sigma_1 - \sigma_2)}$ ☐ (*d*) $\tan 2\theta = \frac{2\tau}{\sigma_1 + \sigma_2}$ ☐

33. In question 31, the maximum shear stress is given by

(*a*) $\pm\frac{1}{2}\sqrt{(\sigma_1 + \sigma_2)^2 + 4\tau^2}$ ☐ (*b*) $\pm\frac{1}{2}\sqrt{(\sigma_1 - \sigma_2)^2 + 4\tau^2}$ ☐

(*c*) $\pm\sqrt{\left(\frac{\sigma_1 + \sigma_2}{2}\right)^2 + 4\tau^2}$ ☐ (*d*) $\pm\sqrt{\left(\frac{\sigma_1 - \sigma_2}{2}\right)^2 + 4\tau^2}$ ☐

34. The planes on which maximum shear stress act is given by

(*a*) $\tan 2\theta_1 = \frac{\sigma_1 - \sigma_2}{2\tau}$ ☐ (*b*) $\tan 2\theta_1 = \frac{\tau}{2(\sigma_1 - \sigma_2)}$ ☐

(*c*) $\tan 2\theta_1 = \frac{2\tau}{(\sigma_1 - \sigma_2)}$ ☐ (*d*) $\tan 2\theta_1 = \frac{2\tau}{\sigma_1 + \sigma_2}$ ☐

35. Figure 10.6 shows a member subjected to a force *P* which is parallel to the axis and at a distance *x* from the axis. The member is rectangular in section. The resultant stress at any point is equal to

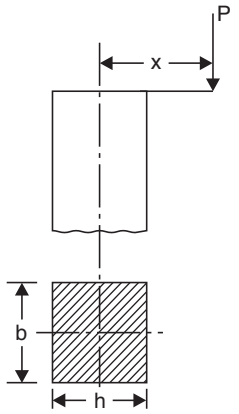

FIGURE 10.6

(*a*) $\frac{P}{b \times h}$ ☐

(*b*) $\frac{P}{b \times h} \pm P \times x$ ☐

(*c*) $\frac{P}{b \times h} \pm \frac{P \times x \times 6}{bh^2}$ ☐

(*d*) $\frac{P}{b \times h} \pm \frac{P \times x \times 12}{bh^3}$ ☐

36. In question 35, maximum stress due to bending will be equal to

(*a*) $P \times x$ ☐ (*b*) $\frac{6P \times x}{bh^2}$ ☐

(*c*) $\frac{12 \times P \times x}{b \times h^2}$ ☐ (*d*) $\frac{12P \times x}{b^2 \times h}$ ☐

37. In question 35, the direct stress and maximum bending stress will be equal if

(*a*) $x = \frac{h}{2}$ ☐ (*b*) $x = \frac{h}{3}$ ☐

(*c*) $x = \frac{h}{4}$ ☐ (*d*) $x = \frac{h}{6}$ ☐

38. A shaft is subjected to twisting moment (T) and bending moment (M). The equivalent bending moment is equal to

(*a*) $\frac{1}{2} \cdot [M + \sqrt{(M^2 + T^2)}\,]$ ☐ (*b*) $\frac{1}{2}\sqrt{(M^2 + T^2)}$ ☐

(*c*) $\sqrt{(M^2 + T^2)}$ ☐ (*d*) $M + \sqrt{M^2 + T^2}$ ☐

39. In the above question, the equivalent twisting moment is equal to

(*a*) $\frac{1}{2} \cdot [M + \sqrt{(M^2 + T^2)}\,]$ ☐ (*b*) $\frac{1}{2}\sqrt{(M^2 + T^2)}$ ☐

(*c*) $\sqrt{(M^2 + T^2)}$ ☐ (*d*) $M + \sqrt{M^2 + T^2}$ ☐

Torsion of Shaft

40. The torque transmitted by a rotating hollow shaft is equal to

(*a*) $\frac{\pi}{16}\tau\, d_o^{\,3}$ ☐ (*b*) $\frac{\pi}{16}\tau\,(d_o^{\,3} - d_i^{\,3})$ ☐

(*c*) $\frac{\pi}{16}\tau\, d_o^{\,3}\,(1 - k^4)$ ☐ (*d*) $\frac{\pi}{16}\tau\, d_o^{\,3}\,(1 - k^3)$ ☐

where τ = Torsional shear stress, d_o = Outside diameter of the shaft,

d_i = Inside diameter of the shaft, and $k = \frac{d_i}{d_o}$ = Ratio of inside diameter to outside diameter.

41. The relation between the diameter of the solid shaft and the diameters of a hollow shaft, which is having the same material and equal in strength to the solid shaft, is given by

(*a*) $d = d_o\,(1 - k^4)$ ☐ (*b*) $d = d_o\,(1 - k^4)^{1/3}$ ☐

(*c*) $d = d_o\,(1 + k^2)$ ☐ (*d*) $d = d_o\,(1 + k^3)$ ☐

where d = Diameter of the solid shaft, d_o = Outer diameter of the hollow shaft, and k = Ratio of inside diameter to outside diameter of a hollow shaft.

42. A shaft is designed on the basis of

(*a*) strength ☐ (*b*) rigidity ☐

(*c*) strength and rigidity ☐ (*d*) none of the above. ☐

43. Choose the wrong statement

(*a*) Ductile materials are designed on the basis of maximum shear stress theory. ☐

(*b*) Brittle materials are designed on the basis of maximum normal stress theory. ☐

(*c*) If the twisting moments of the two shafts are equal, they will have equal strength. ☐
(*d*) A shafts is subjected to shear stresses only. ☐

44. Torsional rigidity of a shaft is equal to
(*a*) product of modulus of rigidity and polar moment of inertia ☐
(*b*) sum of modulus of rigidity and polar moment of inertia ☐
(*c*) difference of modulus of rigidity and polar moment of inertia ☐
(*d*) ratio of modulus of rigidity and polar moment of inertia. ☐

45. Two shafts, one solid and other hollow, are made of the same materials and are having same length and weight. The hollow shaft as compared to solid shaft will be
(*a*) more strong ☐ (*b*) less strong ☐
(*c*) having same strength ☐ (*d*) none of the above. ☐

46. The torque required to produce a twist of one radian per unit length of the shaft is known as
(*a*) polar modulus ☐ (*b*) torsional rigidity ☐
(*c*) flexural rigidity ☐ (*d*) maximum twisting moment. ☐

47. The ratio of torque transmitted by a hollow shaft (of inside diameter equal to the half of the outer diameter) to the torque transmitted by a solid shaft of the same material and of the same weight is equal to
(*a*) 1/2 ☐ (*b*) 1/4 ☐
(*c*) 3/4 ☐ (*d*) 15/16. ☐

48. If the diameter of a solid shaft is increased two times, the torque transmitted will be
(*a*) two times ☐ (*b*) four times ☐
(*c*) eight times ☐ (*d*) sixteen times. ☐

49. A solid shaft of diameter 100 mm is subjected to a maximum bending moment of 4,000 Nm and maximum torque of 3,000 Nm. The equivalent bending moment is
(*a*) 5000 Nm ☐ (*b*) 4500 Nm ☐
(*c*) 4000 Nm ☐ (*d*) 3500 Nm. ☐

50. In question 49, the equivalent torque will be equal to
(*a*) 5000 Nm ☐ (*b*) 4500 Nm ☐
(*c*) 4000 Nm ☐ (*d*) 3500 Nm. ☐

51. In question 49, the maximum shear stress will be
(*a*) $80/\pi$ N/mm^2 ☐ (*b*) $160/\pi$ N/mm^2 ☐
(*c*) $144/\pi$ N/mm^2 ☐ (*d*) $100/\pi$ N/mm^2. ☐

52. Two shafts, one solid and the other hollow, of the same material will have the same strength if they are having
(*a*) same length and same weight ☐ (*b*) same length and same polar modulus ☐
(*c*) same weight and same polar modulus ☐ (*d*) same length, weight and polar modulus. ☐

53. For calculating stresses in a hollow shaft subjected to torsion, the radius taken into consideration is
(*a*) outer radius ☐ (*b*) inner radius ☐
(*c*) mean radius ☐ (*d*) none of the above. ☐

54. Which of the following is a wrong statement?

(*a*) From a number of shafts of the same length and material, the shaft with greatest polar modulus will resist the maximum twisting moment. ☐

(*b*) For a shaft of a given material, the magnitude of polar modulus is a measure of its strength in resisting torsion. ☐

(*c*) Shaft of the same material, and length having the same polar modulus have the same strength. ☐

(*d*) The torsional rigidity of a shaft = C/J. ☐

55. Which one of a correct statement?

(*a*) Hot rolling produces a stronger shaft than cold rolling. ☐

(*b*) Cold rolling produces a stronger shaft than hot rolling. ☐

(*c*) Shaft are not made by rolling process. ☐

(*d*) Angle of twist of shaft is inversely proportional to shaft diameter. ☐

56. Yield point in fatigue loading as compared to static loading is

(*a*) higher ☐ (*b*) lower ☐

(*c*) same ☐ (*d*) none of the above. ☐

57. Fatigue strength

(*a*) increases by cold working ☐ (*b*) decreases by cold working ☐

(*c*) increases by hot working ☐ (*d*) none of the above. ☐

58. Choose the wrong statement

(*a*) The fatigue life of a part can be improved by shot peening. ☐

(*b*) The notch angle of the Izod impact test specimen is 45°. ☐

(*c*) The procedure of increasing fatigue limit by overstressing the metal by successively increasing loadings is known as Coaxing. ☐

(*d*) In Vicker's hardness testing, the pyramid indentor apex is 60°. ☐

59. The technique 'brittle coating' is used for

(*a*) experimental stress analysis ☐

(*b*) protecting metal against corrosion ☐

(*c*) non-destructive testing of metals ☐

(*d*) determining brittleness. ☐

60. Choose the correct statement

(*a*) Resilience of a material is important, when it is subjected shock loading. ☐

(*b*) The ultimate strength of steel in tension in comparison to shear is in the ratio of 3 : 2. ☐

(*c*) Stress concentration is caused due to abrupt change of section. ☐

(*d*) Stress concentration is cyclic loading is more serious in ductile materials. ☐

(*e*) All of the above. ☐

(*f*) None of the above. ☐

System of Limits

61. The largest permissible size for a dimension is known as

(*a*) lower limit ☐ (*b*) upper limit ☐

(*c*) basic size ☐ (*d*) actual size. ☐

62. The smallest permissible size for a dimension is known as

(*a*) lower limit ☐ (*b*) upper limit ☐

(*c*) basic size ☐ (*d*) actual size. ☐

63. The difference between the upper limit and lower limit of a dimension is known as

(*a*) basic size ☐ (*b*) nominal size ☐

(*c*) tolerance ☐ (*d*) actual size. ☐

64. A system is said to unilateral, if

(*a*) tolerance is zero ☐ (*b*) tolerance is one direction ☐

(*c*) tolerance is in two direction ☐ (*d*) none of the above. ☐

65. A system is said to bilateral, if

(*a*) tolerance is zero ☐ (*b*) tolerance is one direction ☐

(*c*) tolerance is in two direction ☐ (*d*) none of the above. ☐

66. The size of a shaft is given as $30^{+0.003}_{-0.003}$, it means

(*a*) the system is bilateral ☐ (*b*) upper limit is +0.003 ☐

(*c*) lower limit is –0.003 ☐ (*d*) all of the above ☐

(*e*) none of the above. ☐

67. The size of a part, to which all limits of variation are determined, is called

(*a*) actual size ☐ (*b*) basic size ☐

(*c*) tolerance ☐ (*d*) zone of tolerance. ☐

68. Choose the correct statement

(*a*) The algebraic difference between the lower limit and basic size is called lower deviation. ☐

(*b*) The algebraic difference between an actual size and corresponding basic size is known as actual deviation. ☐

(*c*) The algebraic difference between the upper limit and the basic size is called upper deviation. ☐

(*d*) All of the above. ☐

(*e*) None of the above. ☐

69. Figure 10.7 shows a shaft and a hole. The distance *D* is known as

(*a*) upper limit ☐

(*b*) lower limit ☐

(*c*) tolerance ☐

(*d*) allowance. ☐

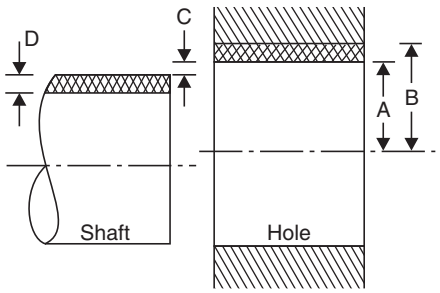

FIGURE 10.7

70. In Fig. 10.7, the distance C is known as

(*a*) upper limit ☐ (*b*) lower limit ☐

(*c*) tolerance ☐ (*d*) allowance. ☐

71. In Fig. 10.7, the distance A is known as

(*a*) upper limit ☐ (*b*) lower limit ☐

(*c*) tolerance ☐ (*d*) allowance. ☐

72. In Fig. 10.7, the distance B is known as

(*a*) upper limit ☐ (*b*) lower limit ☐

(*c*) tolerance ☐ (*d*) allowance. ☐

73. In Fig. 10.7, the distance $(B - A)$ is known as

(*a*) upper limit ☐ (*b*) lower limit ☐

(*c*) tolerance ☐ (*d*) allowance. ☐

74. Choose the wrong statement

(*a*) Fit is defined as the degree of tightness or looseness between two mating parts. ☐

(*b*) The interference is the amount by which the actual size of a shaft is larger than the actual finished size of the mating hole. ☐

(*c*) The clearance is the amount by which the actual size of the shaft is less than the actual size of the mating hole. ☐

(*d*) First are of two types namely hole basis fit and shaft basis fit. ☐

75. Figure 10.8 shows the different types of fits. Fig. 10.8 (*a*), represents

(*a*) transition fit ☐ (*b*) clearance fit ☐

(*c*) interference fit ☐ (*d*) none of the above. ☐

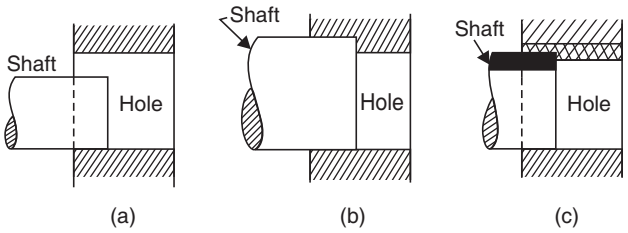

FIGURE 10.8

76. Figure 10.8 (*b*) represents

(*a*) transition fit ☐ (*b*) clearance fit ☐

(*c*) interference fit ☐ (*d*) none of the above. ☐

77. Figure 10.8 (*c*) represents

(*a*) transition fit ☐ (*b*) clearance fit ☐

(*c*) interference fit ☐ (*d*) none of the above. ☐

78. The system of limits and fits, according to Indian Standard (IS : 1919–1963) consists of

(*a*) fundamental tolerances = 25 and fundamental deviations = 16 ☐

(*b*) fundamental tolerances =16 and fundamental deviations = 25 ☐

(*c*) fundamental tolerances = 10 and fundamental deviations = 25 ☐

(*d*) fundamental tolerances =16 and fundamental deviations = 20. ☐

79. Choose the correct statement

(*a*) A limit system is said to be on a shaft basis if the hole is kept constant and shaft size is varied. ☐

(*b*) A limit system is said to be on a hole basis if the shaft is kept constant and the hole size is varied. ☐

(*c*) The standard tolerances are determined in terms of standard tolerances unit '*t*' in microns. ☐

(*d*) The standard tolerance unit (*i*), for the first fundamental tolerance (IT 1), is equal to 0.45 + 0.000 *D* where *D* is diameter in mm. ☐

80. S.A.E. 3120 means

(*a*) Carbon steel with 0.15 to 0.25 per cent carbon ☐

(*b*) Nickel steel with 1 to 1.5 per cent carbon ☐

(*c*) Chrome nickel steel with 1 to 1.5% nickel and 0.15 to 0.25% carbon ☐

(*d*) Chromium steel with 0.15 to 0.25% carbon. ☐

81. Choose the wrong statement

(*a*) S.A.E. stands for Society of Automobile Engineers. ☐

(*b*) A.S.T.M. stands for American Society for Testing Materials. ☐

(*c*) A.S.A. stands for American Standard Association. ☐

(*d*) Preferred numbers are of a series of numbers in arithmetic progression. ☐

82. Basic shaft is one

(*a*) whose lower deviation is zero ☐

(*b*) whose upper deviation is zero ☐

(*c*) whose upper and lower deviations are zero ☐

(*d*) none of the above. ☐

83. Basic hole is one

(*a*) whose lower deviation is zero ☐

(*b*) whose upper deviation is zero ☐

(*c*) whose upper and lower deviations are zero ☐

(*d*) none of the above. ☐

84. The notation 70 H 6/g 5 means

(*a*) basic size is 70 mm ☐

(*b*) basic size is 70 mm and tolerance grade for shaft is 6 and for the hole is 5 ☐

(*c*) basic size is 70 mm and tolerance grade for a hole is 6 and for the shall is 5 ☐

(*d*) basic size is 30 mm and tolerance grade is one. ☐

85. The fatigue duration of parts can be increased by a process, known as

(*a*) electroplating ☐ (*b*) shot-peening ☐

(*c*) finishing and polishing ☐ (*d*) decraburisation. ☐

Bolts, Nuts and Threads

86. A cylindrical rod, with both ends threaded, is known as a

(*a*) bolt ☐ (*b*) stud ☐

(*c*) tap bolt ☐ (*d*) set-screw. ☐

87. A cylinderial rod, having a head at one end and a nut fitted to the other end, is known as a

(*a*) bolt ☐ (*b*) stud ☐

(*c*) tap bolt ☐ (*d*) set-screw. ☐

88. A cylindrical rod, having a head at one end and other end lilting into a tapped hole in the other parts to be joined, is known as a

(*a*) bolt ☐ (*b*) stud ☐

(*c*) tap bolt ☐ (*d*) set-screw. ☐

89. A cylindrical rod, having a head at one end and is threaded practically throughout its length, is known as a

(*a*) bolt ☐ (*b*) stud ☐

(*c*) tap bolt ☐ (*d*) set-screw. ☐

90. Which one of the following threads is not used for transmission of power?

(*a*) Square thread ☐ (*b*) Buttress thread ☐

(*c*) B.S.W. thread ☐ (*d*) Acme thread. ☐

91. Which of the following threads is used when the force acts entirely in one direction?

(*a*) Square thread ☐ (*b*) Buttress thread ☐

(*c*) B.S.W. thread ☐ (*d*) Acme thread. ☐

92. Choose the correct statement

(*a*) Acme thread and knuckle thread are the modification of the square thread. ☐

(*b*) Buttress thread is a combination of triangular and square threads. ☐

(*c*) *M* 20 means metric thread with diameter of screw as 20 mm. ☐

(*d*) B.S.W. threads are used for power transmission. ☐

93. The diameter of a cylindrical rod, on which threads are cut, is known as

(*a*) major diameter ☐ (*b*) minor diameter ☐

(*c*) nominal diameter ☐ (*d*) pitch diameter. ☐

94. The diameter, at the root of the thread, is known as

(*a*) major diameter ☐ (*b*) minor diameter ☐

(*c*) nominal diameter ☐ (*d*) pitch diameter ☐

(*e*) core diameter ☐ (*f*) (*b*) or (*e*). ☐

95. The diameter, at the crest of the thread, is known as

(*a*) major diameter ☐ (*b*) minor diameter ☐

(*c*) nominal diameter ☐ (*d*) pitch diameter ☐

96. Which one of the following threads is having smallest included angle?

(*a*) Acme thread ☐ (*b*) B.S.W. thread ☐

(*c*) Buttress thread ☐ (*d*) Unified thread. ☐

97. Which one of the following threads is having largest included angle?

(*a*) Acme thread ☐ (*b*) B.S.W. thread ☐

(*c*) Buttress thread ☐ (*d*) Unified thread. ☐

98. The included angle for Buttress threads is

(*a*) 60° ☐ (*b*) 55° ☐

(*c*) 45° ☐ (*d*) 29°. ☐

99. The included angle for Acme threads is

(*a*) 60° ☐ (*b*) 55° ☐

(*c*) 45° ☐ (*d*) 29°. ☐

100. A screw, which is similar to a tap bolt and is used to prevent relative movement between the two parts, is known as

(*a*) machine screw ☐ (*b*) cap screw ☐

(*c*) set-screw ☐ (*d*) none of the above. ☐

101. A screw, which is slotted for a screw driver and are generally used with a nut, is known as

(*a*) machine screw ☐ (*b*) cap screw ☐

(*c*) set-screw ☐ (*d*) none of the above. ☐

102. A screw, which is similar to a tap bolt except that they are of small size and a greater variety of shapes of heads are available, is known as

(*a*) machine screw ☐ (*b*) cap screw ☐

(*c*) set-screw ☐ (*d*) none of the above. ☐

103. *M* 30 × 2 for a bolt represents

(*a*) metric threads of 30 mm outside diameter and 2 mm pitch ☐

(*b*) metric threads of 60 mm^2 cross-sectional area ☐

(*c*) metric threads on a bolt of length 30 cm ☐

(*d*) none of the above. ☐

104. A coarse screw of major diameter 6 mm and pitch 1 mm according to IS : 1362–1962 is designated as

(*a*) *M* × 6 × 1 ☐ (*b*) *M* 6 × 1 ☐

(*c*) 6 *M* × 1 ☐ (*d*) *M* 6. ☐

105. A fine screw of major diameter 36 mm and pitch 3 mm according to IS : 1362–1962 is designated as

(*a*) *M* × 36 × 3 ☐ (*b*) *M* 36 × 3 ☐

(*c*) 36 *M* × 3 ☐ (*d*) *M* 36. ☐

106. The pitch of 24 mm diameter metric find threads would be

(*a*) 3 mm ☐ (*b*) 2 mm ☐

(*c*) 1.5 mm ☐ (*d*) 1 mm. ☐

107. If in the above question, the threads are coarse then pitch would be

(*a*) 3 mm ☐ (*b*) 2 mm ☐

(*c*) 1.5 mm ☐ (*d*) 1 mm. ☐

108. Choose the wrong statement

(*a*) For a double start threads, lead is equal to twice the pitch. ☐

(*b*) If the threads on a bolt are right-handed, then the threads on the nut will be also right-handed. ☐

(*c*) A stud is having threads on both ends. ☐

(*d*) The included angle for the acme thread is 55°. ☐

109. Eye bolts are used for

(*a*) transmission of power ☐ (*b*) locking devices ☐

(*c*) lifting and transporting heavy pieces ☐ (*d*) absorption of shocks and vibrations. ☐

110. The basis on which bolts are generally designed for initial tension due to screwing up with a large factor of safety is

(*a*) direct bending stress ☐ (*b*) direct tensile stress ☐

(*c*) direction shear stress ☐ (*d*) direct compressive stress. ☐

111. The initial tension in a bolt (in M.K.S. units) used for making fluid tight joint is equal to

(*a*) $284 \times d$ ☐ (*b*) $142\ d$ ☐

(*c*) $81 \times d$ ☐ (*d*) $568 \times d$ ☐

where d = Nominal diameter of bolt in mm.

112. The stresses included in a bolt, when it is subjected to an external load, will be

(*a*) shear stress ☐ (*b*) tensile stress ☐

(*c*) both shear and tensile stress ☐ (*d*) any one of the above. ☐

113. On which the resultant axial load on a bolt depends

(*a*) the initial tension due to tightening of the bolt ☐

(*b*) the external load applied ☐

(*c*) the relative elastic yielding of the bolt and the connected member ☐

(*d*) all of the above ☐

(*e*) none of the above. ☐

114. The resultant axial load (P) on a bolt is given by

(*a*) $P = P_1 + \frac{a}{a+1} P_2$ ☐ (*b*) $P = P_1 - \frac{a}{a+1} P_2$ ☐

(*c*) $P = P_1 + \frac{a}{a-1} P_2$ ☐ (*d*) $P = P_1 + \frac{a+1}{a} P_2$. ☐

where P_1 = Initial tension in the bolt due to tightening up,

P_2 = External load on the bolt, and

a = Ratio of elasticity of connected parts to the elasticity of the bolt.

115. When a soft gaskets are connected by large bolts, then the resultant axis load on the bolt is equal to

(*a*) sum of initial tension and external load applied ☐

(*b*) mean of the initial tension and external load applied ☐

(*c*) initial tension only ☐

(*d*) external load only ☐

(*e*) initial tension or external load whichever is greater. ☐

116. For marking a leak proof joint, the bolts or studs are screwed up tightly along with metal gasket or asbestos packing. The minimum diameter of the bolt or stud (used for this purpose) should be at least

(*a*) 5 mm ☐ (*b*) 10 mm ☐

(*c*) 16 mm ☐ (*d*) 24 mm. ☐

117. A bolt can be made of uniform strength by

(*a*) drilling an axial hole through the head upto threaded portion ☐

(*b*) turning down the diameter of the shank of the bolt ☐

(*c*) increasing the diameter of the shank of the bolt ☐

(*d*) (*a*) and (*b*) only. ☐

118. The diameter of the hole, that must be drilled in the head of the bolt to make the bolt of uniform strength, is equal to

(*a*) $D_o - D_c$ ☐ (*b*) $\frac{D_o + D_c}{2}$ ☐

(*c*) $\sqrt{D_o^2 - D_c^2}$ ☐ (*d*) $\frac{D_o - D_c}{4}$. ☐

where D_o = Outside diameter of thread, and D_c = Core diameter of thread.

119. If the nut is made of a weaker material than the bolt, then the height of the nut should be

(*a*) equal to nominal diameter of the bolt ☐

(*b*) less than the nominal diameter of the bolt ☐

(*c*) more than the nominal diameter of the bolt ☐

(*d*) none of the above. ☐

120. Choose the wrong statement

(*a*) For leak-proof joint, the circumferential pitch of the studs should be between $20\sqrt{d_1}$ and $30\sqrt{d_1}$ where d_1 is the diameter of stud hole in mm. ☐

(*b*) The effective height of the nut is made equal to the nominal diameter of the bolt, when a nut and bolt are made of mild steel. ☐

(*c*) If an axial hole is drilled through the head of a bolt upto threaded portion such that the area of the shank becomes equal to the root area of the thread, the bolt of uniform strength is obtained. ☐

(*d*) Turn buckle has left hand threads on both ends. ☐

121. Figure 10.9 shows a bracket having a rectangular base and bolted to a wall by means of four bolts. The bracket supports a load W. Two bolts are at a distance L_1 from O and other two are at a distance L_2 from O. If all the bolts are having equal cross-sectional area and w be the load per unit distance due to turning effect, then the total tensile load, on each bolt at distance L_1 from O, will be

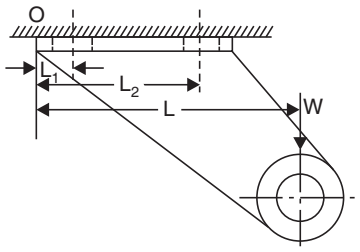

FIGURE 10.9

(*a*) $\frac{W}{4}$ ☐ (*b*) $\frac{w \times L_1}{2}$ ☐

(*c*) $\frac{W}{4} + wL_1$ ☐ (*d*) $\frac{W}{4} + \frac{wL_1}{2}$. ☐

122. In the question 121 (refer to Fig. 10.9), the total tensile load on each bolt at a distance L_2 from O, will be

(*a*) $\frac{W}{4}$ ☐ (*b*) $\frac{w \times L_2}{2}$ ☐

(*c*) $\frac{W}{4} + wL_2$ ☐ (*d*) $\frac{W}{4} + \frac{wL_3}{2}$. ☐

123. In the question 121 (refer to Fig. 10.9), the value of the load in the bolt per unit distance due to turning effect (*i.e.*, value of w) is equal to

(*a*) $\frac{2WL}{L_1^2 + L_2^2}$ ☐ (*b*) $\frac{WL}{2(L_1^2 + L_2^2)}$ ☐

(*c*) $\frac{WL}{4(L_1^2 + L_2^2)}$ ☐ (*d*) $\frac{4WL}{(L_1^2 + L_2^2)}$. ☐

124. In the question 121 (refer to Fig. 10.9) all the bolts are

(*a*) equally loaded ☐

(*b*) two bolt at a distance L_1 are heavily loaded ☐

(*c*) two bolts at a distance L_2 are heavily loaded ☐

(*d*) none of the above. ☐

125. If in Fig. 10.9, the bracket supports a load of 4000 N and the distances L_1 L_2 and L are equal to 10 cm, 30 cm and 50 cm respectively then the load in the bolt per unit distance due to turning effect will be

(*a*) 50 N ☐ (*b*) 100 N ☐

(*c*) 125 N ☐ (*d*) 150 N. ☐

126. For the question 125, the total tensile load carried by each bolt at a distance 10 cm from O (refer to Fig. 10.9) will be

(*a*) 4000 N ☐ (*b*) 3000 N ☐

(*c*) 2000 N ☐ (*d*) 1000 N. ☐

127. For the question 125, the total tensile load carried by each bolt at a distance 30 cm from O (refer to Fig. 10.9) will be

(*a*) 4000 N ☐ (*b*) 3000 N ☐

(*c*) 2000 N ☐ (*d*) 1000 N. ☐

128. Figure 10.10 shows a wall bracket carrying an eccentric load of 800 N perpendicular to the axis of four bolts. Two bolts are at a distance of 5 cm from A and the other two are at a distance of 15 cm from A. If the bolts are of the same size, then each bolt will be subjected to

(*a*) direct shear stress ☐

(*b*) direct tensile stress ☐

(*c*) direct compressive stress ☐

(*d*) none of the above. ☐

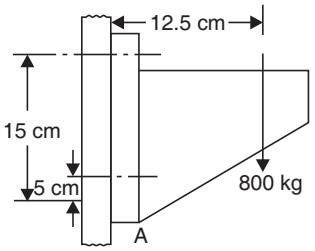

FIGURE 10.10

129. In Fig. 10.10, the load 800 kg will try to tilt the bracket about *A*. The stresses induced in each bolt due to turning moment, will be

(*a*) tensile ☐ (*b*) compressive ☐

(*c*) shear ☐ (*d*) none of the above. ☐

130. In question 128, the shear load carried by each bolt is equal to

(*a*) 100 N ☐ (*b*) 200 N ☐

(*c*) 300 N ☐ (*d*) 400 N. ☐

131. In question 128, the maximum tensile load carried by bolts which are at a distance 15 cm from *A*, will be equal to

(*a*) 100 N ☐ (*b*) 200 N ☐

(*c*) 300 N ☐ (*d*) 400 N. ☐

132. In question 128, the equivalent shear load will be equal to

(*a*) 100 N ☐ (*b*) 200 N ☐

(*c*) 250 N ☐ (*d*) 400 N. ☐

133. In question 128, the equivalent tensile load will be equal to

(*a*) 100 N ☐ (*b*) 200 N ☐

(*c*) 250 N ☐ (*d*) 400 N. ☐

134. The rotation of a bolt, while screwing a nut on or off the bolt, is prevented by providing on the bolt

(*a*) a square neck ☐ (*b*) a pip ☐

(*c*) a snug ☐ (*d*) any one of the above ☐

(*e*) none of the above. ☐

135. The locking arrangement for the nut is done by

(*a*) a split pin ☐ (*b*) a slotted nut ☐

(*c*) a castle nut ☐ (*d*) a sawn nut ☐

(*e*) a ring nut ☐ (*f*) any one of the above. ☐

136. A locking device, in which slots are cut in a cylindrical collar provided on the top of the nut on opposite faces and a split pin passes through the two slots in the nut and a hole in the bolt, is known as

(*a*) ring nut ☐ (*b*) slotted nut ☐

(*c*) castle nut ☐ (*d*) sawn nut. ☐

137. A locking device, in which slots are cut in the upper end of the nut on opposite faces and a split pin passes through the two slots in the nut and a hole in the bolt, is known as

(*a*) ring nut ☐ (*b*) slotted nut ☐

(*c*) castle nut ☐ (*d*) sawn nut. ☐

138. A locking device, in which a slot is cut half way across the nut and a small screw is tightened between the nut and the bolt, is known as

(*a*) ring nut ☐ (*b*) slotted nut ☐

(*c*) castle nut ☐ (*d*) sawn nut. ☐

139. A locking device, which is widely used in automobile and locomotive engines, is a

(*a*) ring nut ☐ (*b*) slotted nut ☐

(*c*) castle nut ☐ (*d*) sawn nut. ☐

140. Which forms of rivet heads of the following are mostly used for general work?

(*a*) conical ☐ (*b*) ellipsoid ☐

(*c*) snap ☐ (*d*) countersunk ☐

(*e*) (*a*) and (*b*) ☐ (*f*) (*c*) and (*d*). ☐

141. Which forms of the rivet heads of the following are generally used in boiler work?

(*a*) conical ☐ (*b*) ellipsoid ☐

(*c*) snap ☐ (*d*) countersunk ☐

(*e*) (*a*) and (*b*) ☐ (*f*) (*c*) and (*d*). ☐

142. Which of the following screw thread is used for power transmission in either direction?

(*a*) Buttress threads ☐ (*b*) Acme threads ☐

(*c*) Square threads ☐ (*d*) All of the above. ☐

143. Efficiency of a square threaded screw, neglecting collar friction is given by

(*a*) $\frac{\tan \alpha}{\tan \phi}$ ☐ (*b*) $\frac{\tan \alpha}{\tan (\alpha + \phi)}$ ☐

(*c*) $\frac{\tan \phi}{\tan \alpha}$ ☐ (*d*) $\frac{\tan \phi}{\tan (\alpha + \phi)}$. ☐

where α = Helix angle, and ϕ = Angle of friction.

144. The efficiency of a square threaded screw will be maximum, if the helix angle is equal to

(*a*) $\frac{\pi}{4} + \frac{\phi}{2}$ ☐

(*b*) $\frac{\pi}{4} - \phi$ ☐

(*c*) $\frac{\pi}{4} - \frac{\phi}{2}$ ☐

(*d*) $\frac{\pi}{4} + \phi$ ☐

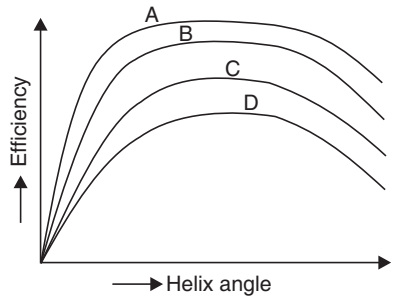

FIGURE 10.11

where ϕ = Angle of friction.

145. Figure 10.11 shows the variation of efficiency of a square threaded screw for raising the load with the helix angle (α) for four different values of μ equal to 0.15, 0.125, 0.10 and 0.05. Curve *A* holds good for the values of μ, equal to

(*a*) 0.15 ☐ (*b*) 0.125 ☐

(*c*) 0.10 ☐ (*d*) 0.05. ☐

146. In Fig. 10.11, curve *B* holds good for the value of μ equal to

(*a*) 0.15 ☐ (*b*) 0.125 ☐

(*c*) 0.10 ☐ (*d*) 0.05. ☐

147. In Fig. 10.11, curve *C* holds good for the value of μ equal to

(*a*) 0.15 ☐ (*b*) 0.125 ☐

(*c*) 0.10 ☐ (*d*) 0.05. ☐

148. In Fig. 10.11, curve *D* holds good for the value of μ equal to

(*a*) 0.15 ☐ (*b*) 0.125 ☐

(*c*) 0.10 ☐ (*d*) 0.05. ☐

149. Factor of safety is the ratio of

(*a*) tensile stress to working stress ☐ (*b*) compressive stress to working stress ☐

(*c*) yield stress to working stress ☐ (*d*) bearing stress to working stress. ☐

150. The nut length, when shearing stress in nut is half the tensile stress in a bolt, would be equal to

(*a*) half the diameter of bolt ☐

(*b*) diameter of bolt ☐

(*c*) one and a half times the diameter of bolt ☐

(*d*) two times the diameter of the bolt. ☐

Riveted Joints

151. The two plates are to be joined by rivets. The plates are touching each other and two cover plates are placed on both sides of the main plates and then riveted. This type of joint is called

(*a*) lap joint ☐ (*b*) butt joint ☐

(*c*) single strap joint ☐ (*d*) double strap butt joint. ☐

152. Which of the following is a permanent fastening?

(*a*) screws ☐ (*b*) bolts and nuts ☐

(*c*) riveting ☐ (*d*) cotter ☐

(*e*) keys ☐ (*f*) none of the above. ☐

153. Which of the following is a temporary fastenings?

(*a*) welding ☐ (*b*) bolts and nuts ☐

(*c*) riveting ☐ (*d*) forging ☐

(*e*) soldering ☐ (*f*) none of the above. ☐

154. The distance between the centre of the rivet hole to the nearest edge of the plate is known as

(*a*) pitch ☐ (*b*) diagonal pitch ☐

(*c*) margin ☐ (*d*) back pitch. ☐

155. Two plates are joined by rivets. The tearing of the plate at an edge may be avoided if the margin is made at least equal to

(*a*) 0.25 *d* ☐ (*b*) 0.5 *d* ☐

(*c*) 1.0 *d* ☐ (*d*) 1.5 *d* ☐

where *d* = Diameter of the rivet.

156. Two plates are joined by rivets. The pull required to tear off the plate across a row of rivets per pitch length is equal to

(*a*) $(p - d)t \times \sigma_t$ ☐ (*b*) $p \times t \times \sigma_t$ ☐

(*c*) $d \times t \times \sigma_t$ ☐ (*d*) $(p + d) \times t \times \sigma_t$ ☐

where d = Diameter of rivet, p = Pitch of rivets,

t = Thickness of plate, and σ_t = Permissible tensile stress.

157. The plates are joined by a lap joint. The pull required to shear off the rivet per pitch length is equal to

(*a*) $n \times \frac{\pi}{4} d^2 \times \tau$ ☐ (*b*) $n \times 2 \times \frac{\pi}{4} d^2 \times \tau$ ☐

(*c*) $n \times 3 \times \frac{\pi}{4} d^2 \times \tau$ ☐ (*d*) $n \times 1.875 \times \frac{\pi}{4} d^2 \times \tau$. ☐

where n = Number of rivets per pitch length, d = Diameter of rivet, and

τ = Permissible shear stress for the rivet material.

158. Two plates are joined by a simple cover butt joint. The pull required to shear off the rivet per pitch length is equal to

(*a*) $n \times \frac{\pi}{4} d^2 \times \tau$ ☐ (*b*) $n \times 2 \times \frac{\pi}{4} d^2 \times \tau$ ☐

(*c*) $n \times 3 \times \frac{\pi}{4} d^2 \times \tau$ ☐ (*d*) $n \times 1.875 \times \frac{\pi}{4} d^2 \times \tau$. ☐

159. Two plates are joined by a double cover butt joint. The theoretical pull required to shear off the rivet per pitch length is equal to

(*a*) $n \times \frac{\pi}{4} d^2 \times \tau$ ☐ (*b*) $n \times 2 \times \frac{\pi}{4} d^2 \times \tau$ ☐

(*c*) $n \times 3 \times \frac{\pi}{4} d^2 \times \tau$ ☐ (*d*) $n \times 1.875 \times \frac{\pi}{4} d^2 \times \tau$. ☐

160. In question 159, according to Indian Boiler Regulation (I.B.R.), the pull required to shear off the rivets per pitch length is equal to

(*a*) $n \times \frac{\pi}{4} d^2 \times \tau$ ☐ (*b*) $n \times 2 \times \frac{\pi}{4} d^2 \times \tau$ ☐

(*c*) $n \times 3 \times \frac{\pi}{4} d^2 \times \tau$ ☐ (*d*) $n \times 1.875 \times \frac{\pi}{4} d^2 \times \tau$. ☐

161. Two plates are joined by a lap joint. The pull required to crush the rivet per pitch length is equal to

(*a*) $n \times d \times t \times \sigma_c$ ☐ (*b*) $\pi(d - t) \times t \times \sigma_c$ ☐

(*c*) $n \times \left(\frac{\pi}{4} d^2 - dt\right) \sigma_c$ ☐ (*d*) $n \times \frac{\pi}{4} d^2 \times \sigma_c$. ☐

where σ_c = Permissible crushing stress, n = Number of rivets per pitch length under crushing,

and d = Diameter of rivet.

162. The strength of a riveted joint is equal to

(*a*) the pull required to shear off the rivet ☐ (*b*) the pull required to crush the rivet ☐

(*c*) the pull required to tear off the plate ☐ (*d*) minimum of the above three values ☐

(*e*) maximum of the above three values. ☐

163. The efficiency of a riveted joint is the ratio of

(*a*) the pull required to shear off the rivets to the strength of unriveted plate ☐

(*b*) the pull required to crush the rivet to the strength of unriveted plate ☐

(*c*) the pull required to tear off the plate to the strength of unriveted plate ☐

(*d*) the strength of the riveted joint to the strength of unriveted plate. ☐

164. Two plates of thickness 5 mm are joined by a double riveted double cover butt joints. The diameter of rivets is 7 mm and pitch = 28 mm. The permissible tensile, shear and crushing stresses are 120 N/mm^2, 100 N/mm^2 and 150 N/mm^2 respectively. The pull required to tear off the plate across the row of rivets per pitch length is equal to

(*a*) 15400 N ☐ (*b*) 16800 N ☐

(*c*) 12600 N ☐ (*d*) 9800 N. ☐

165. In question 164, the theoretical pull required to shear off the rivets per pitch length is equal to

(*a*) 15400 N ☐ (*b*) 16800 N ☐

(*c*) 12600 N ☐ (*d*) 9800 N. ☐

166. In question 164, the pull required to crush the rivet per pitch length is equal to

(*a*) 15400 N ☐ (*b*) 16800 N ☐

(*c*) 12600 N ☐ (*d*) 9800 N. ☐

167. In question 164, the strength of the joint is equal to

(*a*) 15400 N ☐ (*b*) 16800 N ☐

(*c*) 12600 N ☐ (*d*) 9800 N. ☐

168. In question 164, the efficiency of the joint is equal to

(*a*) 80% ☐ (*b*) 70% ☐

(*c*) 58.33% ☐ (*d*) 50%. ☐

169. Unwin's empirical formula is used to find

(*a*) pitch of a riveted joint ☐

(*b*) diameter of the rivet hole, when thickness of the plates is less than 8 mm ☐

(*c*) diameter of the rivet hole, when thickness of the plate is more than 8 mm ☐

(*d*) none of the above. ☐

170. In Lozenge joint

(*a*) diamond riveting is used ☐

(*b*) number of rivets in each row is the same ☐

(*c*) number of rivets in each row goes no decreasing as we proceed from the outermost row to innermost row ☐

(*d*) none of the above. ☐

171. Lozenge joint is called a joint of

(*a*) maximum strength ☐ (*b*) minimum strength ☐

(*c*) uniform strength ☐ (*d*) none of the above. ☐

172. Diamond riveting is used for

(*a*) structural work ☐ (*b*) boiler work ☐

(*c*) structural and boiler ☐ (*d*) none of the above. ☐

173. If the diameter of the rivets varies from 12 mm to 24 mm, then according to I.S.I., the diameter of the rivet hole is equal to the diameter of rivet plus

(*a*) 0.5 mm ☐ (*b*) 1 mm ☐

(*c*) 1.5 mm ☐ (*d*) 2 mm. ☐

174. Which one is a wrong statement ?

(*a*) A butt joint with a single strap is in single shear. ☐

(*b*) A butt joint with double strap is in double shear. ☐

(*c*) The tearing of the plate at an edge can be avoided if the margin is equal to 1.5 times the diameter of the rivet bole. ☐

(*d*) The thickness of the boiler shell, according to I.B.R. (Indian Boiler Regulation) should not be more than 7 mm. ☐

175. Which one is a correct statement?

(*a*) The ratio of pitch to the diameter of the rivet is equal to one by two if the tearing efficiency of the riveted joint is 50%. ☐

(*b*) In chain riveting joints, minimum distance between the rows of the rivets should be equal to the diameter of rivet hole. ☐

(*c*) A butt joint with two cover plates should be used for longitudinal joint in boilers. ☐

(*d*) All of the above. ☐

(*e*) None of the above. ☐

176. The diameter '*d*' of the rivet for the given thickness '*t*' of the plate and to take up a given load *F* is given by

(*a*) $d = 1.91\sqrt{t}$ when *d* and *t* are in mm ☐ (*b*) $d = 6\sqrt{t}$ when *d* and *t* are in cm ☐

(*c*) both (*a*) and (*b*) ☐ (*d*) none of the above. ☐

177. In a butt joint, the thickness for the butt straps according to I.B.R. should not be less than

(*a*) 7 mm ☐ (*b*) 5 mm ☐

(*c*) 10 mm ☐ (*d*) 20 mm. ☐

178. In a butt joint if two unequal widths of straps are used, then the thickness of butt straps is

(*a*) $6.625 \times t$ and $0.5 \times t$ for wide strap and narrow strap ☐

(*b*) $0.75t$ and $0.625t$ for wide strap and narrow strap ☐

(*c*) $0.75t$ and $0.5t$ for wide strap and narrow strap ☐

(*d*) $0.5t$ and $0.35t$ for wide strap and narrow strap ☐

where t = Thickness of main plates.

179. For equal number of rivets is more than one row for lap joint or butt joint, the pitch of the rivets should not be less than

(*a*) $\frac{d}{2}$ ☐ (*b*) d ☐

(*c*) 1.5 d ☐ (*d*) 2 d. ☐

where d = Diameter of rivet hole.

180. The pitch of the rivets is calculated by assuming the efficiency of the joint given by

(*a*) $\eta = \frac{p}{p-d}$ ☐ (*b*) $\eta = \frac{p}{p+d}$ ☐

(*c*) $\eta = \frac{p-d}{p}$ ☐ (*d*) $\eta = \frac{p+2}{p+2d}$. ☐

181. According to I.B.R., the maximum value of the pitch of rivets for a longitudinal joint of a boiler is given by

(*a*) 4.128 cm ☐ (*b*) t + 4.128 cm ☐

(*c*) $C \times t$ + 4.128 cm ☐ (*d*) $\frac{C \times t}{4.128}$ ☐

where t = Thickness of the shell plate in cm, and C = Constant.

182. A lap joint connecting two plates of thickness 16 mm is to be designed for an axial load of 64000 N. The permissible stresses are tensile stress = 40 N/mm^2, shear stress = 30 N/mm^2 and crushing stress = 70 N/mm^2. The diameter of the rivet would be equal to

(*a*) 244 mm ☐ (*b*) 24.4 mm ☐

(*c*) 2.44 mm ☐ (*d*) 10 mm. ☐

183. The width of the plates in question 182, would be equal to

(*a*) 124.4 mm ☐ (*b*) 12.44 mm ☐

(*c*) 200 mm ☐ (*d*) 250 mm. ☐

184. Choose the correct statement

(*a*) The diameter of the rivet, for the given thickness of the plate and to take up a given load, is obtained by Unwin's formula. ☐

(*b*) The pitch of the rivets is calculated by equating the shearing strength to the tearing strength of the joint. ☐

(*c*) The thickness of the boiler shell should not be less than 7 mm. ☐

(*d*) All of the above. ☐

(*e*) None of the above. ☐

Welded Joints

185. In a transverse double fillet welded lap joint, the allowable tensile stress for the well metal is equal to

(*a*) $\frac{1.414\,F}{h \times l}$ ☐ (*b*) $\frac{0.707\,F}{h \times l}$ ☐

(*c*) $\frac{4.414\,F}{h \times l}$ ☐ (*d*) $\frac{3F}{h \times l}$. ☐

where h = Thickness of the plate, l = Length of weld.

524. The stress induced by a suddenly applied load W on a beam of cross-sectional area A is W/A.

(*a*) True ☐ (*b*) False. ☐

525. For experimental stress analysis, brittle coating technique is used.

(*a*) True ☐ (*b*) False. ☐

526. The notch angle of the Izod impact test specimen is usually 30°.

(*a*) True ☐ (*b*) False. ☐

527. For brittle material, maximum principal stress theory is used.

(*a*) True ☐ (*b*) False. ☐

528. If the twisting moment of two shafts is same, then the two shafts will have equal strength.

(*a*) True ☐ (*b*) False. ☐

529. For ductile materials, the maximum shear stress theory is used.

(*a*) True ☐ (*b*) False. ☐

530. Eutectoid steel means a steel containing 0.85% carbon.

(*a*) True ☐ (*b*) False. ☐

531. The ductility of steel increases, when percentage of carbon in steel is increased.

(*a*) True ☐ (*b*) False. ☐

532. By sand mould casting, the gears are casted.

(*a*) True ☐ (*b*) False. ☐

533. Cold working decreases fatigue strength.

(*a*) True ☐ (*b*) False. ☐

534. The boiler plates edges are bevelled to an angle of 45°.

(*a*) True ☐ (*b*) False. ☐

535. A lap joint is always in single shear.

(*a*) True ☐ (*b*) False. ☐

536. The ratio of least value of tearing resistance, crushing resistance or shearing resistance to the strength of solid plate, is known as efficiency of the joint.

(*a*) True ☐ (*b*) False. ☐

537. To connect two co-axial rods, a cotter joint is used.

(*a*) True ☐ (*b*) False. ☐

538. The included angle for the acme thread is 55°.

(*a*) True ☐ (*b*) False. ☐

539. When shafts are arranged parallel and rotate in the same directions, then an open belt drive is used.

(*a*) True ☐ (*b*) False. ☐

540. To secure high efficiency, multiple threads are used.

(*a*) True ☐ (*b*) False. ☐

541. If the efficiency of a machine is less than 50%, the machine will be self-locking.

(*a*) True ☐ (*b*) False. ☐

Fill in the blanks:

542. For ....., Rankine's theory is used.

(*a*) ductile materials ☐ (*b*) brittle materials. ☐

543. For ....., Guest's theory is used.

(*a*) ductile materials ☐ (*b*) brittle materials. ☐

544. The cast iron will be of ....., when carbon in the cast iron is principally in the form of graphite.

(*a*) white colour ☐ (*b*) grey colour. ☐

545. The module is the ..... of diametral pitch.

(*a*) square ☐ (*b*) reciprocal. ☐

546. There is a ..... of lubricant between the journal and the bearing in a boundary lubricated bearing.

(*a*) thin film ☐ (*b*) thick film. ☐

547. Screws used for power transmission should have .....

(*a*) high efficiency ☐ (*b*) low efficiency. ☐

548. A feather key is generally ..... in shaft and loose in hub.

(*a*) loose ☐ (*b*) tight. ☐

549. The ..... coupling is designed as a hollow shaft.

(*a*) Oldham ☐ (*b*) Muff. ☐

550. A cotter joint is used to connect two ..... rods.

(*a*) parallel ☐ (*b*) co-axial. ☐

551. The ..... threads arc commonly used in railway carriage couplings.

(*a*) square ☐ (*b*) buttress. ☐

552. As rivetted joint is a ..... fastening.

(*a*) temporary ☐ (*b*) permanent. ☐

553. A ..... is always in single shear.

(*a*) lap joint ☐ (*b*) butt joint. ☐

554. For pipes which carry steam at high pressure, mostly ..... joint is used.

(*a*) riveted ☐ (*b*) expansion. ☐

555. The strength of rivetted joint is equal to the ..... value of P_t, P_s and P_c, where P_t = tearing resistance, P_s = shearing resistance and P_c = crushing resistance.

(*a*) least ☐ (*b*) maximum. ☐

556. The circumferential stress in thin cylinders is ..... times the longitudinal stress.

(*a*) two ☐ (*b*) three. ☐

24. Two shafts, one solid and the other hollow, of the same material will have the same strength if they are having

(*a*) same length and weight ☐

(*b*) same length and same polar modulus ☐

(*c*) same weight and same polar modulus ☐

(*d*) same length, weight and polar modulus. ☐

25. If principal stresses corresponding to a two dimensional state of stress are σ_1 and σ_2 and σ_1 is greater than σ_2 and both are tensile, then which one of the following would be the correct criterion for failure by yielding, according to the maximum shear stress criterion?

(*a*) $\frac{(\sigma_1 - \sigma_2)}{2} = \pm \frac{\sigma_{yp}}{2}$ ☐ (*b*) $\frac{\sigma_1}{2} = \pm \frac{\sigma_{yp}}{2}$ ☐

(*c*) $\frac{\sigma_2}{2} = \pm \frac{\sigma_{yp}}{2}$ ☐ (*d*) $\sigma_1 = \pm 2\sigma_{yp}$. ☐

(IES 1993)

26. A solid circular shaft is subjected to a maximum shear stress of 140 MPa. The magnitude of the maximum normal stress developed in the shaft is

(*a*) 140 MPa ☐ (*b*) 80 MPa ☐

(*c*) 70 MPa ☐ (*d*) 60 MPa. ☐

(IAS 1995)

27. Match list I with list II and select the correct answer using the codes given below the lists:

List I	**List II**
A. Crankshaft	1. Supports the revolving parts and transmits torque
B. Wire shaft	2. Transmits motion between shafts where it is not possible to effect a rigid coupling between them
C. Axle	3. Converts linear motion into rotary motion
D. Plain shaft	4. Supports only the revolving parts

Codes:

	A	*B*	*C*	*D*	
(*a*)	3	2	1	4	☐
(*b*)	4	2	3	1	☐
(*c*)	3	2	4	1	☐
(*d*)	1	4	2	3	☐

(IES 1995)

28. The power transmitted by a belt is dependent on the centrifugal effect in the belt. The maximum power can be transmitted when the centrifugal tension is

(*a*) $\frac{1}{3}$ of tension (T_1) on the tight side. ☐

(*b*) $\frac{1}{3}$ of total tension (T_t) on the tight side. ☐

(*c*) $\frac{1}{3}$ of the tension (T_2) on the slack side. ☐

(*d*) $\frac{1}{3}$ of sum of tensions T_1 and T_2 *i.e.*, $\frac{1}{3}(T_1 + T_2)$. ☐

29. A transmission shaft subjected to bending loads must be designed on the basis of

(*a*) maximum normal stress theory ☐

(*b*) maximum shear stress theory ☐

(*c*) maximum normal stress and maximum shear stress theories ☐

(*d*) fatigue strength. ☐

(IES 1995)

30. A shaft can safety transmit 90 kW while rotating at a given speed. If this shaft is replaced by a shaft of diameter double of the previous one and rotated at half the speed of the previous, the power that can be transmitted by the new shaft is

(*a*) 90 kW ☐ (*b*) 180 kW ☐

(*c*) 360 kW ☐ (*d*) 720 kW. ☐

31. When compared to a rod of same diameter and material, a wire rope

(*a*) is less flexible ☐

(*b*) has a much smaller load carrying capacity ☐

(*c*) does not provided much warning before failure ☐

(*d*) provides much greater time for remedial action before failure. ☐

(IES 1994)

32. A cold rolled steel shaft is designed on the basis of maximum shear stress theory. The principal stresses induced at its critical section are 60 MPa and −60 MPa respectively. If the yield stress for the shift material is 360 MPa, the factor of safety of the design is

(*a*) 2 ☐ (*b*) 3 ☐

(*c*) 4 ☐ (*d*) 6. ☐

33. A 50 kW motor using six *V*-belts is used in a pulp mill. If one of the belts breaks after a month of continuous running, then

(*a*) the broken belt is to be replaced by a similar belt ☐

(*b*) all the belts are to be replaced ☐

(*c*) the broken belt and two adjacent belts are to be replaced ☐

(*d*) the broken belt and one adjacent belt is to be replaced ☐

(IAS 1994)

34. The bolts in a rigid flanged coupling connecting two shafts transmitting power are subjected to

(*a*) shear force and bending moment ☐

(*b*) axial force ☐

(*c*) torsion and bending moment ☐

(*d*) torsion. ☐

58. The unit of elastic modulus is same as those of

(*a*) stress, shear modulus and pressure ☐ (*b*) strain, shear modulus and force ☐

(*c*) shear modulus, stress and force ☐ (*d*) stress, strain and pressure. ☐

(IAS 1994)

59. Which theory of failure will you use for aluminium components under steady loading?

(*a*) Principal stress theory ☐ (*b*) Principal strain theory ☐

(*c*) Strain energy theory ☐ (*d*) Maximum shear stress theory. ☐

(GATE 1999)

60. A test specimen is stressed slightly beyond the yield point and then unloaded. Its yield strength will

(*a*) decrease ☐ (*b*) increase ☐

(*c*) remain same ☐ (*d*) become equal to ultimate tensile strength. ☐

(GATE 1995)

61. Fatigue strength of a rod subjected to cyclic axial force is less than that of a rotating beam of the same dimensions subjected to steady lateral force because

(*a*) axial stiffness is less than bending stiffness ☐

(*b*) of absence of centrifugal effects in rod ☐

(*c*) the number of discontinuities vulnerable to fatigue are more in the rod ☐

(*d*) at a particular time, the rod has only one type of stress whereas the beam has both the tensile and compressive stresses. ☐

(GATE 1992)

62. **Assertion (A):** Endurance limits for all materials are always less than the ultimate strength of the corresponding materials.

Reason (R): Stress concentration in a machine part due to any dislocation is very damaging when the part is subjected to variable loading.

(*a*) *A* is true and *R* is false. ☐ (*b*) *A* is false and *R* is true. ☐

(*c*) both *A* and *R* are true. ☐ (*d*) both *A* and *R* are wrong. ☐

(IAS 1994)

ANSWERS

Answers to Objective Type Questions

1. (*b*)	**2.** (*a*)	**3.** (*d*)	**4.** (*d*)	**5.** (*c*)	**6.** (*d*)
7. (*c*)	**8.** (*b*)	**9.** (*a*)	**10.** (*c*)	**11.** (*d*)	**12.** (*a*)
13. (*b*)	**14.** (*c*)	**15.** (*e*)	**16.** (*d*)	**17.** (*d*)	**18.** (*d*)
19. (*a*)	**20.** (*d*)	**21.** (*b*)	**22.** (*a*)	**23.** (*d*)	**24.** (*d*)
25. (*a*)	**26.** (*c*)	**27.** (*b*)	**28.** (*d*)	**29.** (*b*)	**30.** (*c*)
31. (*a*)	**32.** (*c*)	**33.** (*b*)	**34.** (*a*)	**35.** (*c*)	**36.** (*b*)
37. (*d*)	**38.** (*a*)	**39.** (*c*)	**40.** (*c*)	**41.** (*b*)	**42.** (*c*)

43. (*d*)	**44.** (*a*)	**45.** (*a*)	**46.** (*b*)	**47.** (*d*)	**48.** (*c*)
49. (*b*)	**50.** (*a*)	**51.** (*a*)	**52.** (*b*)	**53.** (*a*)	**54.** (*d*)
55. (*b*)	**56.** (*b*)	**57.** (*a*)	**58.** (*d*)	**59.** (*a*)	**60.** (*e*)
61. (*b*)	**62.** (*a*)	**63.** (*c*)	**64.** (*b*)	**65.** (*c*)	**66.** (*d*)
67. (*b*)	**68.** (*d*)	**69.** (*c*)	**70.** (*d*)	**71.** (*b*)	**72.** (*a*)
73. (*c*)	**74.** (*d*)	**75.** (*b*)	**76.** (*c*)	**77.** (*a*)	**78.** (*b*)
79. (*c*)	**80.** (*c*)	**81.** (*d*)	**82.** (*a*)	**83.** (*a*)	**84.** (*c*)
85. (*b*)	**86.** (*b*)	**87.** (*a*)	**88.** (*c*)	**89.** (*d*)	**90.** (*c*)
91. (*b*)	**92.** (*d*)	**93.** (*c*)	**94.** (*f*)	**95.** (*a*)	**96.** (*a*)
97. (*d*)	**98.** (*c*)	**99.** (*d*)	**100.** (*c*)	**101.** (*a*)	**102.** (*b*)
103. (*a*)	**104.** (*d*)	**105.** (*b*)	**106.** (*b*)	**107.** (*a*)	**108.** (*d*)
109. (*c*)	**110.** (*b*)	**111.** (*a*)	**112.** (*d*)	**113.** (*d*)	**114.** (*a*)
115. (*a*)	**116.** (*c*)	**117.** (*d*)	**118.** (*c*)	**119.** (*c*)	**120.** (*d*)
121. (*c*)	**122.** (*c*)	**123.** (*b*)	**124.** (*c*)	**125.** (*b*)	**126.** (*c*)
127. (*a*)	**128.** (*a*)	**129.** (*a*)	**130.** (*b*)	**131.** (*c*)	**132.** (*c*)
133. (*b*)	**134.** (*c*)	**135.** (*d*)	**136.** (*c*)	**137.** (*b*)	**138.** (*d*)
139. (*c*)	**140.** (*f*)	**141.** (*e*)	**142.** (*c*)	**143.** (*b*)	**144.** (*c*)
145. (*d*)	**146.** (*c*)	**147.** (*b*)	**148.** (*a*)	**149.** (*c*)	**150.** (*b*)
151. (*d*)	**152.** (*c*)	**153.** (*b*)	**154.** (*c*)	**155.** (*d*)	**156.** (*a*)
157. (*a*)	**158.** (*a*)	**159.** (*b*)	**160.** (*d*)	**161.** (*a*)	**162.** (*d*)
163. (*d*)	**164.** (*c*)	**165.** (*a*)	**166.** (*d*)	**167.** (*d*)	**168.** (*c*)
169. (*c*)	**170.** (*a*)	**171.** (*c*)	**172.** (*a*)	**173.** (*c*)	**174.** (*d*)
175. (*c*)	**176.** (*d*)	**177.** (*c*)	**178.** (*b*)	**179.** (*c*)	**180.** (*c*)
181. (*c*)	**182.** (*b*)	**183.** (*a*)	**184.** (*d*)	**185.** (*b*)	**186.** (*a*)
187. (*d*)	**188.** (*c*)	**189.** (*a*)	**190.** (*c*)	**191.** (*d*)	**192.** (*b*)
193. (*a*)	**194.** (*c*)	**195.** (*c*)	**196.** (*a*)	**197.** (*c*)	**198.** (*b*)
199. (*b*)	**200.** (*d*)	**201.** (*d*)	**202.** (*d*)	**203.** (*d*)	**204.** (*d*)
205. (*c*)	**206.** (*e*)	**207.** (*f*)	**208.** (*c*)	**209.** (*c*)	**210.** (*c*)
211. (*d*)	**212.** (*b*)	**213.** (*b*)	**214.** (*c*)	**215.** (*a*)	**216.** (*c*)
217. (*c*)	**218.** (*c*)	**219.** (*d*)	**220.** (*b*)	**221.** (*b*)	**222.** (*e*)
223. (*d*)	**224.** (*c*)	**225.** (*c*)	**226.** (*b*)	**227.** (*c*)	**228.** (*d*)
229. (*c*)	**230.** (*b*)	**231.** (*b*)	**232.** (*b*)	**233.** (*c*)	**234.** (*b*)
235. (*d*)	**236.** (*a*)	**237.** (*b*)	**238.** (*a*)	**239.** (*b*)	**240.** (*a*)
241. (*b*)	**242.** (*d*)	**243.** (*a*)	**244.** (*c*)	**245.** (*a*)	**246.** (*c*)
247. (*b*)	**248.** (*a*)	**249.** (*c*)	**250.** (*a*)	**251.** (*d*)	**252.** (*a*)
253. (*a*)	**254.** (*b*)	**255.** (*d*)	**256.** (*d*)	**257.** (*b*)	**258.** (*d*)
259. (*d*)	**260.** (*a*)	**261.** (*c*)	**262.** (*a*)	**263.** (*b*)	**264.** (*a*)
265. (*c*)	**266.** (*c*)	**267.** (*b*)	**268.** (*d*)	**269.** (*e*)	**270.** (*c*)
271. (*b*)	**272.** (*a*)	**273.** (*b*)	**274.** (*c*)	**275.** (*a*)	**276.** (*c*)

277. (*c*) **278.** (*b*) **279.** (*a*) **280.** (*b*) **281.** (*a*) **282.** (*c*)
283. (*d*) **284.** (*d*) **285.** (*e*) **286.** (*d*) **287.** (*d*) **288.** (*f*)
289. (*b*) **290.** (*a*) **291.** (*d*) **292.** (*c*) **293.** (*b*) **294.** (*a*)
295. (*c*) **296.** (*d*) **297.** (*a*) **298.** (*b*) **299.** (*b*) **300.** (*a*)
301. (*d*) **302.** (*c*) **303.** (*a*) **304.** (*b*) **305.** (*a*) **306.** (*d*)
307. (*d*) **308.** (*e*) **309.** (*b*) **310.** (*d*) **311.** (*c*) **312.** (*a*)
313. (*d*) **314.** (*c*) **315.** (*a*) **316.** (*b*) **317.** (*c*) **318.** (*b*)
319. (*b*) **320.** (*a*) **321.** (*c*) **322.** (*a*) **323.** (*c*) **324.** (*c*)
325. (*d*) **326.** (*b*) **327.** (*a*) **328.** (*c*) **329.** (*b*) **330.** (*c*)
331. (*b*) **332.** (*d*) **333.** (*d*) **334.** (*c*) **335.** (*b*) **336.** (*c*)
337. (*a*) **338.** (*b*) **339.** (*b*) **340.** (*c*) **341.** (*a*) **342.** (*d*)
343. (*b*) **344.** (*d*) **345.** (*b*) **346.** (*b*) **347.** (*b*) **348.** (*d*)
349. (*d*) **350.** (*b*) **351.** (*b*) **352.** (*a*) **353.** (*d*) **354.** (*d*)
355. (*b*) **356.** (*c*) **357.** (*a*) **358.** (*b*) **359.** (*b*) **360.** (*b*)
361. (*b*) **362.** (*a*) **363.** (*d*) **364.** (*c*) **365.** (*b*) **366.** (*a*)
367. (*e*) **368.** (*c*) **369.** (*b*) **370.** (*d*) **371.** (*b*) **372.** (*a*)
373. (*d*) **374.** (*b*) **375.** (*c*) **376.** (*c*) **377.** (*b*) **378.** (*a*)
379. (*b*) **380.** (*d*) **381.** (*b*) **382.** (*c*) **383.** (*f*) **384.** (*c*)
385. (*c*) **386.** (*c*) **387.** (*c*) **388.** (*d*) **389.** (*a*) **390.** (*b*)
391. (*b*) **392.** (*a*) **393.** (*d*) **394.** (*d*) **395.** (*b*) **396.** (*a*)
397. (*a*) **398.** (*d*) **399.** (*b*) **400.** (*c*) **401.** (*d*) **402.** (*f*)
403. (*d*) **404.** (*d*) **405.** (*b*) **406.** (*c*) **407.** (*d*) **408.** (*f*)
409. (*b*) **410.** (*d*) **411.** (*b*) **412.** (*c*) **413.** (*b*) **414.** (*a*)
415. (*a*) **416.** (*c*) **417.** (*b*) **418.** (*d*) **419.** (*b*) **420.** (*b*)
421. (*a*) **422.** (*c*) **423.** (*a*) **424.** (*b*) **425.** (*c*) **426.** (*b*)
427. (*b*) **428.** (*a*) **429.** (*c*) **430.** (*d*) **431.** (*c*) **432.** (*b*)
433. (*c*) **434.** (*c*) **435.** (*c*) **436.** (*b*) **437.** (*b*) **438.** (*b*)
439. (*c*) **440.** (*b*) **441.** (*d*) **442.** (*d*) **443.** (*c*) **444.** (*c*)
445. (*a*) **446.** (*e*) **447.** (*c*) **448.** (*b*) **449.** (*d*) **450.** (*b*)
451. (*b*) **452.** (*b*) **453.** (*b*) **454.** (*b*) **455.** (*c*) **456.** (*c*)
457. (*c*) **458.** (*c*) **459.** (*b*) **460.** (*c*) **461.** (*c*) **462.** (*d*)
463. (*b*) **464.** (*b*) **465.** (*a*) **466.** (*b*) **467.** (*b*) **468.** (*a*)
469. (*b*) **470.** (*d*) **471.** (*c*) **472.** (*c*) **473.** (*c*) **474.** (*b*)
475. (*c*) **476.** (*c*) **477.** (*d*) **478.** (*c*) **479.** (*b*) **480.** (*a*)
481. (*c*) **482.** (*b*) **483.** (*b*) **484.** (*a*) **485.** (*c*) **486.** (*b*)
487. (*d*) **488.** (*c*) **489.** (*c*) **490.** (*b*) **491.** (*c*) **492.** (*a*)
493. (*b*) **494.** (*c*) **495.** (*a*) **496.** (*b*) **497.** (*c*) **498.** (*b*)

499. (*c*) **500.** (*b*).

True/False

501. (*a*) **502.** (*b*) **503.** (*a*) **504.** (*a*) **505.** (*a*) **506.** (*b*)
507. (*b*) **508.** (*b*) **509.** (*a*) **510.** (*a*) **511.** (*a*) **512.** (*a*)
513. (*a*) **514.** (*a*) **515.** (*a*) **516.** (*a*) **517.** (*a*) **518.** (*b*)
519. (*b*) **520.** (*b*) **521.** (*a*) **522.** (*a*) **523.** (*a*) **524.** (*b*)
525. (*a*) **526.** (*b*) **527.** (*a*) **528.** (*a*) **529.** (*a*) **530.** (*a*)
531. (*b*) **532.** (*b*) **533.** (*b*) **534.** (*b*) **535.** (*a*) **536.** (*a*)
537. (*a*) **538.** (*b*) **539.** (*a*) **540.** (*a*) **541.** (*a*).

Fill in the Blanks

542. (*a*) **543.** (*a*) **544.** (*b*) **545.** (*b*) **546.** (*a*) **547.** (*a*)
548. (*b*) **549.** (*b*) **550.** (*b*) **551.** (*b*) **552.** (*b*) **553.** (*a*)
554. (*b*) **555.** (*a*) **556.** (*a*) **557.** (*b*) **558.** (*b*) **559.** (*b*)
560. (*a*) **561.** (*b*) **562.** (*a*) **563.** (*b*) **564.** (*b*) **565.** (*b*)
566. (*b*) **567.** (*b*) **568.** (*a*).

Answers to Objective Type Questions from Competitive Examinations

1. (*b*) **2.** (*c*) **3.** (*c*) **4.** (*b*) **5.** (*c*) **6.** (*d*)
7. (*c*) **8.** (*b*) **9.** (*c*) **10.** (*c*) **11.** (*b*) **12.** (*d*)
13. (*d*) **14.** (*d*) **15.** (*a*) **16.** (*a*) **17.** (*c*) **18.** (*b*)
19. (*b*) **20.** (*d*) **21.** (*b*) **22.** (*b*) **23.** (*b*) **24.** (*b*)
25. (*b*) **26.** (*a*) **27.** (*c*) **28.** (*b*) **29.** (*c*) **30.** (*a*)
31. (*d*) **32.** (*b*) **33.** (*b*) **34.** (*a*) **35.** (*a*) **36.** (*d*)
37. (*a*) **38.** (*d*) **39.** (*d*) **40.** (*d*) **41.** (*b*) **42.** (*c*)
43. (*b*) **44.** (*d*) **45.** (*d*) **46.** (*d*) **47.** (*d*) **48.** (*d*)
49. (*a*) **50.** (*c*) **51.** (*a*) **52.** (*d*) **53.** (*e*) **54.** (*d*)
55. (*c*) **56.** (*d*) **57.** (*c*) **58.** (*a*) **59.** (*d*) **60.** (*b*)
61. (*d*) **62.** (*c*).