

PRACTICE EXAM 6: PE MECHANICAL—MACHINE DESIGN AND MATERIALS (100 QUESTIONS)

This practice exam contains 100 questions. Select the single best answer for each question. The official NCEES examination contains 80 questions and provides 8 hours of testing time within a 9-hour appointment. Use both SI and U.S. Customary units as indicated.

1. A drawing dimension is 433.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 5499.1 mm
- B. 16497.3 mm
- C. 10998.2 mm
- D. 11023.6 mm

2. A machine saves 10310 labor-hours annually at \$1787/h. Ignoring interest, its \$97100 residual value is credited evenly over a 8-year evaluation. What is the annual net benefit?

- A. 1145429.38 \$/year
- B. 2290858.75 \$/year
- C. 2315133.75 \$/year
- D. 4581717.5 \$/year

3. A proposed fixture has a fixed fabrication cost of \$35580 and a variable cost of \$438000 spread over 1784 units. What is the average cost per unit?

- A. 35825.52 \$/unit
- B. 17912.76 \$/unit
- C. 39408.07 \$/unit
- D. 71651.03 \$/unit

4. A component is expected to experience 893 MPa maximum stress, while its allowable design stress is 231.25 MPa. What design factor is implied?

- A. 1.93
- B. 4.36
- C. 7.72
- D. 3.86

5. A drawing dimension is 435.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 11049 mm
- B. 5524.5 mm
- C. 16573.5 mm
- D. 11074.4 mm

6. A machine saves 10350 labor-hours annually at \$1795/h. Ignoring interest, its \$97500 residual value is credited evenly over a 6-year evaluation. What is the annual net benefit?

- A. 1540062.5 \$/year
- B. 3112625 \$/year
- C. 3080125 \$/year
- D. 6160250 \$/year

7. A proposed fixture has a fixed fabrication cost of \$35740 and a variable cost of \$440000 spread over 1792 units. What is the average cost per unit?

- A. 17992.77 \$/unit
- B. 35985.54 \$/unit
- C. 39584.09 \$/unit
- D. 71971.07 \$/unit

8. A component is expected to experience 897 MPa maximum stress, while its allowable design stress is 232.25 MPa. What design factor is implied?

- A. 1.93
- B. 4.36
- C. 7.72
- D. 3.86

9. A drawing dimension is 437.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 5549.9 mm
- B. 16649.7 mm
- C. 11125.2 mm
- D. 11099.8 mm

10. A machine saves 10390 labor-hours annually at \$1803/h. Ignoring interest, its \$97900 residual value is credited evenly over a 7-year evaluation. What is the annual net benefit?

- A. 1331090.71 \$/year
- B. 2690152.86 \$/year
- C. 2662181.43 \$/year
- D. 5324362.86 \$/year

11. A proposed fixture has a fixed fabrication cost of \$35900 and a variable cost of \$442000 spread over 1800 units. What is the average cost per unit?

- A. 36145.56 \$/unit
- B. 18072.78 \$/unit
- C. 39760.11 \$/unit
- D. 72291.11 \$/unit

12. A component is expected to experience 901 MPa maximum stress, while its allowable design stress is 233.25 MPa. What design factor is implied?

- A. 1.93
- B. 3.86
- C. 4.36
- D. 7.73

13. A drawing dimension is 439.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 11150.6 mm
- B. 5575.3 mm
- C. 16725.9 mm
- D. 11176 mm

14. A machine saves 10430 labor-hours annually at \$1811/h. Ignoring interest, its \$98300 residual value is credited evenly over a 8-year evaluation. What is the annual net benefit?

- A. 1174401.88 \$/year
- B. 2373378.75 \$/year
- C. 4697607.5 \$/year
- D. 2348803.75 \$/year

15. A proposed fixture has a fixed fabrication cost of \$36060 and a variable cost of \$444000 spread over 1808 units. What is the average cost per unit?

- A. 18152.79 \$/unit
- B. 36305.58 \$/unit
- C. 39936.13 \$/unit
- D. 72611.15 \$/unit

16. A component is expected to experience 905 MPa maximum stress, while its allowable design stress is 234.25 MPa. What design factor is implied?

- A. 1.93
- B. 4.36
- C. 3.86
- D. 7.73

17. A rectangular beam 1780 mm wide and 1840 mm deep carries a maximum bending moment of 437.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.22 MPa
- B. 0.63 MPa
- C. 0.44 MPa
- D. 0.77 MPa

18. A steel tie, length 18220 mm and area 4755 mm², carries 1752 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 16.78 mm
- B. 67.13 mm
- C. 17.33 mm
- D. 33.57 mm

19. A ductile member has yield strength 4510 MPa and calculated von Mises stress 1799 MPa. What factor of safety against yielding results?

- A. 1.25
- B. 2.51
- C. 1.51

D. 3.51

20. A pin-ended column has $E = 200,000$ MPa, $I = 93300000$ mm⁴, and length 23525 mm. What is its Euler critical load?

A. 332.78 kN

B. 1331.1 kN

C. 83.19 kN

D. 105.93 kN

21. At a point, $\sigma_x = 1788$ MPa, $\sigma_y = 884$ MPa, and $\tau_{xy} = 452.0$ MPa. What is the von Mises equivalent stress for plane stress?

A. 1735.14 MPa

B. 1994.59 MPa

C. 904 MPa

D. 867.57 MPa

22. A part has alternating stress 1820 MPa and mean stress 925 MPa. With $S_e = 2765$ MPa and $S_{ut} = 4775$ MPa, what Goodman fatigue factor of safety applies?

A. 1.52

B. 5.16

C. 1.4

D. 1.17

23. A prismatic bar carries 1752 kN axial tension over a net area of 4630 mm². What is the average normal stress?

A. 189.2 MPa

B. 378.4 MPa

- C. 189.61 MPa
- D. 567.6 MPa

24. A solid circular shaft of diameter 54 mm transmits 18040 N·m torque. What is its maximum torsional shear stress?

- A. 291.74 MPa
- B. 1166.96 MPa
- C. 583.48 MPa
- D. 1167.51 MPa

25. A rectangular beam 1796 mm wide and 1856 mm deep carries a maximum bending moment of 441.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.21 MPa
- B. 0.43 MPa
- C. 0.62 MPa
- D. 0.76 MPa

26. A steel tie, length 18380 mm and area 4795 mm², carries 1768 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 16.94 mm
- B. 67.77 mm
- C. 17.49 mm
- D. 33.89 mm

27. A ductile member has yield strength 4550 MPa and calculated von Mises stress 1815 MPa. What factor of safety against yielding results?

- A. 1.25

- B. 1.51
- C. 2.51
- D. 3.51

28. A pin-ended column has $E = 200,000 \text{ MPa}$, $I = 94100000 \text{ mm}^4$, and length 23725 mm . What is its Euler critical load?

- A. 329.99 kN
- B. 1319.98 kN
- C. 82.5 kN
- D. 105.04 kN

29. At a point, $\sigma_x = 1804 \text{ MPa}$, $\sigma_y = 892 \text{ MPa}$, and $\tau_{xy} = 456.0 \text{ MPa}$. What is the von Mises equivalent stress for plane stress?

- A. 1750.63 MPa
- B. 2012.48 MPa
- C. 912 MPa
- D. 875.32 MPa

30. A part has alternating stress 1836 MPa and mean stress 933 MPa . With $S_e = 2789 \text{ MPa}$ and $S_{ut} = 4815 \text{ MPa}$, what Goodman fatigue factor of safety applies?

- A. 1.52
- B. 5.16
- C. 1.4
- D. 1.17

31. A prismatic bar carries 1768 kN axial tension over a net area of 4670 mm^2 . What is the average normal stress?

- A. 189.29 MPa
- B. 189.7 MPa
- C. 378.59 MPa
- D. 567.88 MPa

32. A solid circular shaft of diameter 50 mm transmits 18200 N·m torque. What is its maximum torsional shear stress?

- A. 370.77 MPa
- B. 741.53 MPa
- C. 1483.07 MPa
- D. 1483.62 MPa

33. A rectangular beam 1812 mm wide and 1872 mm deep carries a maximum bending moment of 445.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.21 MPa
- B. 0.42 MPa
- C. 0.62 MPa
- D. 0.76 MPa

34. A steel tie, length 18540 mm and area 4835 mm², carries 1784 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 17.1 mm
- B. 68.41 mm
- C. 17.65 mm
- D. 34.2 mm

35. A ductile member has yield strength 4590 MPa and calculated von Mises stress 1831 MPa. What factor of safety against yielding results?

- A. 1.25
- B. 1.51
- C. 2.51
- D. 3.51

36. A pin-ended column has $E = 200,000$ MPa, $I = 94900000$ mm⁴, and length 23925 mm. What is its Euler critical load?

- A. 327.26 kN
- B. 1309.04 kN
- C. 81.81 kN
- D. 104.17 kN

37. At a point, $\sigma_x = 1820$ MPa, $\sigma_y = 900$ MPa, and $\tau_{xy} = 460.0$ MPa. What is the von Mises equivalent stress for plane stress?

- A. 1766.13 MPa
- B. 2030.37 MPa
- C. 920 MPa
- D. 883.06 MPa

38. A part has alternating stress 1852 MPa and mean stress 941 MPa. With $S_e = 2813$ MPa and $S_{ut} = 4855$ MPa, what Goodman fatigue factor of safety applies?

- A. 1.52
- B. 1.17
- C. 5.16
- D. 1.4

39. A prismatic bar carries 1784 kN axial tension over a net area of 4710 mm². What is the average normal stress?

- A. 189.38 MPa
- B. 189.79 MPa
- C. 378.77 MPa
- D. 568.15 MPa

40. A solid circular shaft of diameter 56 mm transmits 18360 N·m torque. What is its maximum torsional shear stress?

- A. 266.22 MPa
- B. 1064.9 MPa
- C. 1065.45 MPa
- D. 532.45 MPa

41. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 8780 N·m, nut factor $K = 0.2$, and nominal diameter is 17 mm.

- A. 2582.35 kN
- B. 2582.62 kN
- C. 3873.53 kN
- D. 5164.71 kN

42. Two parallel fillet welds, each 1782 mm long with 8 mm leg size, carry 871 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 61.1 MPa
- B. 30.55 MPa
- C. 86.42 MPa
- D. 43.21 MPa

43. A lap joint uses 4 identical 12-mm-diameter rivets in single shear to carry 1749 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 15464.56 MPa
- B. 1933.07 MPa
- C. 3866.14 MPa
- D. 7732.28 MPa

44. A bolt transfers 1766 kN through a plate 11 mm thick with an effective bearing diameter of 20 mm. What is the average bearing stress in the plate?

- A. 2555.16 MPa
- B. 8027.27 MPa
- C. 4013.64 MPa
- D. 16054.55 MPa

45. Using the relation $T = KFd$, estimate bolt preload when installation torque is 8820 N·m, nut factor $K = 0.2$, and nominal diameter is 18 mm.

- A. 2450.27 kN
- B. 3675 kN
- C. 490 kN
- D. 2450 kN

46. Two parallel fillet welds, each 1790 mm long with 6 mm leg size, carry 875 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 81.47 MPa
- B. 57.62 MPa
- C. 40.74 MPa
- D. 115.23 MPa

47. A lap joint uses 4 identical 14-mm-diameter rivets in single shear to carry 1757 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 2853.42 MPa
- B. 11413.68 MPa
- C. 1426.71 MPa
- D. 5706.84 MPa

48. A bolt transfers 1774 kN through a plate 12 mm thick with an effective bearing diameter of 20 mm. What is the average bearing stress in the plate?

- A. 2352.84 MPa
- B. 3695.83 MPa
- C. 7391.67 MPa
- D. 14783.33 MPa

49. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 8860 N·m, nut factor $K = 0.2$, and nominal diameter is 16 mm.

- A. 2769.02 kN
- B. 2768.75 kN
- C. 4153.12 kN
- D. 553.75 kN

50. Two parallel fillet welds, each 1798 mm long with 7 mm leg size, carry 879 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 69.84 MPa
- B. 34.92 MPa
- C. 49.39 MPa
- D. 98.78 MPa

51. A lap joint uses 4 identical 16-mm-diameter rivets in single shear to carry 1765 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 2194.6 MPa
- B. 8778.39 MPa
- C. 1097.3 MPa
- D. 4389.19 MPa

52. A bolt transfers 1782 kN through a plate 10 mm thick with an effective bearing diameter of 20 mm. What is the average bearing stress in the plate?

- A. 2836.14 MPa
- B. 4455 MPa
- C. 17820 MPa
- D. 8910 MPa

53. Using the relation $T = KFd$, estimate bolt preload when installation torque is 8900 N·m, nut factor $K = 0.2$, and nominal diameter is 17 mm.

- A. 2617.92 kN
- B. 2617.65 kN
- C. 3926.47 kN
- D. 523.53 kN

54. A 20-tooth pinion rotating at 10250 rpm drives a 58-tooth gear. Neglecting slip, what is the gear speed?

- A. 3534.48 rpm
- B. 1767.24 rpm
- C. 6715.52 rpm
- D. 10250 rpm

55. A shaft transmits 866 hp at 18220 rpm. Using $T(\text{in} \cdot \text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1497.8 in·lbf
- B. 4493.39 in·lbf
- C. 2995.59 in·lbf
- D. 5991.18 in·lbf

56. An open belt connects a 120-mm driver at 9420 rpm to a 300-mm driven pulley. Neglecting slip, what is driven speed?

- A. 1884 rpm
- B. 5652 rpm
- C. 9420 rpm
- D. 3768 rpm

57. A collar bearing supports 434.5 kN at mean friction radius 0.021 m with friction coefficient 0.085. What friction torque must be overcome?

- A. 775.58 N·m
- B. 1551.17 N·m
- C. 1163.37 N·m
- D. 1551.72 N·m

58. A power screw has lead 8 mm, input torque 1753 N·m, and raising efficiency 0.34. What axial load can it raise?

- A. 234.06 kN
- B. 468.11 kN
- C. 702.17 kN
- D. 936.23 kN

59. A 21-tooth pinion rotating at 10300 rpm drives a 60-tooth gear. Neglecting slip, what is the gear speed?

- A. 1802.5 rpm
- B. 6695 rpm
- C. 10300 rpm
- D. 3605 rpm

60. A shaft transmits 871 hp at 18320 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1498.22 in·lbf
- B. 4494.66 in·lbf
- C. 2996.44 in·lbf
- D. 5992.88 in·lbf

61. An open belt connects a 130-mm driver at 9470 rpm to a 320-mm driven pulley. Neglecting slip, what is driven speed?

- A. 1923.59 rpm
- B. 3847.19 rpm
- C. 5622.81 rpm
- D. 9470 rpm

62. A collar bearing supports 437.0 kN at mean friction radius 0.020 m with friction coefficient 0.080. What friction torque must be overcome?

- A. 1398.4 N·m
- B. 1048.8 N·m
- C. 1398.95 N·m
- D. 699.2 N·m

63. A power screw has lead 7 mm, input torque 1763 N·m, and raising efficiency 0.35. What axial load can it raise?

- A. 553.86 kN
- B. 276.93 kN
- C. 830.79 kN
- D. 1107.73 kN

64. A 18-tooth pinion rotating at 10350 rpm drives a 54-tooth gear. Neglecting slip, what is the gear speed?

- A. 1725 rpm
- B. 6900 rpm
- C. 3450 rpm
- D. 10350 rpm

65. A shaft transmits 876 hp at 18420 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 2997.28 in·lbf
- B. 1498.64 in·lbf
- C. 4495.92 in·lbf
- D. 5994.56 in·lbf

66. An open belt connects a 125-mm driver at 9520 rpm to a 310-mm driven pulley. Neglecting slip, what is driven speed?

- A. 1919.35 rpm
- B. 3838.71 rpm
- C. 5681.29 rpm
- D. 9520 rpm

67. A hydraulic cylinder must produce 437.0 kN using a piston area of 9400 mm². Neglecting losses, what gauge pressure is required?

- A. 23.24 MPa
- B. 23.65 MPa
- C. 46.49 MPa
- D. 92.98 MPa

68. A simply supported beam of span 2.7 m carries a central point load of 869 kN. What is the maximum bending moment?

- A. 1173.15 kN·m
- B. 293.29 kN·m
- C. 321.85 kN·m
- D. 586.58 kN·m

69. A lever has an effort arm of 2676 mm and a load arm of 1744 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.65
- B. 2.3
- C. 3.07
- D. 1.53

70. A 266-V DC source is applied across a 9- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 14.78 A
- B. 29.56 A
- C. 44.33 A
- D. 59.11 A

71. A thin-walled cylindrical vessel has internal pressure 88.4 MPa, inside diameter 4670 mm, and wall thickness 14 mm. What is the membrane hoop stress?

- A. 7371.93 MPa
- B. 29487.71 MPa
- C. 14743.86 MPa
- D. 7372.48 MPa

72. A linear spring has stiffness 880 kN/m and is compressed 46 mm. What force does it exert?

- A. 40480 N
- B. 20240 N
- C. 60720 N
- D. 20240.55 N

73. An undamped single-degree system has mass 874 kg and stiffness 452000 N/m. What is its natural frequency in hertz?

- A. 1.81 Hz
- B. 5.43 Hz
- C. 7.24 Hz
- D. 3.62 Hz

74. A hydraulic cylinder must produce 440.5 kN using a piston area of 9470 mm². Neglecting losses, what gauge pressure is required?

- A. 23.26 MPa
- B. 23.67 MPa
- C. 46.52 MPa
- D. 93.03 MPa

75. A simply supported beam of span 2.6 m carries a central point load of 876 kN. What is the maximum bending moment?

- A. 1138.8 kN·m
- B. 569.4 kN·m
- C. 284.7 kN·m
- D. 336.92 kN·m

76. A lever has an effort arm of 2697 mm and a load arm of 1758 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 1.53
- B. 0.65
- C. 2.3
- D. 3.07

77. A 268-V DC source is applied across a 6- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 22.33 A
- B. 44.67 A
- C. 67 A
- D. 89.33 A

78. A thin-walled cylindrical vessel has internal pressure 89.1 MPa, inside diameter 4705 mm, and wall thickness 12 mm. What is the membrane hoop stress?

- A. 8733.66 MPa
- B. 34934.63 MPa
- C. 17467.31 MPa
- D. 8734.21 MPa

79. A linear spring has stiffness 887 kN/m and is compressed 44 mm. What force does it exert?

- A. 19514 N
- B. 58542 N
- C. 19514.55 N
- D. 39028 N

80. An undamped single-degree system has mass 881 kg and stiffness 455500 N/m. What is its natural frequency in hertz?

- A. 3.62 Hz
- B. 1.81 Hz
- C. 5.43 Hz
- D. 7.24 Hz

81. A hydraulic cylinder must produce 444.0 kN using a piston area of 9540 mm². Neglecting losses, what gauge pressure is required?

- A. 23.27 MPa
- B. 23.68 MPa
- C. 46.54 MPa
- D. 93.08 MPa

82. A simply supported beam of span 2.5 m carries a central point load of 883 kN. What is the maximum bending moment?

- A. 551.88 kN·m
- B. 1103.75 kN·m
- C. 275.94 kN·m
- D. 353.2 kN·m

83. A lever has an effort arm of 2718 mm and a load arm of 1772 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.65
- B. 2.3
- C. 3.07
- D. 1.53

84. A 270-V DC source is applied across a 8- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 16.88 A
- B. 33.75 A
- C. 50.62 A
- D. 67.5 A

85. A thin-walled cylindrical vessel has internal pressure 89.8 MPa, inside diameter 4740 mm, and wall thickness 13 mm. What is the membrane hoop stress?

- A. 16371.23 MPa
- B. 8185.62 MPa
- C. 32742.46 MPa
- D. 8186.17 MPa

86. A linear spring has stiffness 894 kN/m and is compressed 42 mm. What force does it exert?

- A. 18774 N
- B. 37548 N
- C. 56322 N
- D. 18774.55 N

87. An undamped single-degree system has mass 888 kg and stiffness 459000 N/m. What is its natural frequency in hertz?

- A. 1.81 Hz
- B. 5.43 Hz
- C. 7.24 Hz
- D. 3.62 Hz

88. A hydraulic cylinder must produce 447.5 kN using a piston area of 9610 mm². Neglecting losses, what gauge pressure is required?

- A. 23.28 MPa
- B. 23.69 MPa
- C. 46.57 MPa
- D. 93.13 MPa

89. A simply supported beam of span 2.4 m carries a central point load of 890 kN. What is the maximum bending moment?

- A. 534 kN·m
- B. 1068 kN·m
- C. 267 kN·m
- D. 370.83 kN·m

90. A machining operation reduces a diameter from 882 mm to 878 mm. What percent reduction in diameter occurs?

- A. 0.46 %
- B. 0.68 %
- C. 0.91 %
- D. 0.45 %

91. Four repeated measurements are 58.53, 58.49, 58.52, and 58.50 mm. What is their arithmetic mean?

- A. 29.25 mm
- B. 58.51 mm
- C. 234.04 mm
- D. 58.53 mm

92. A mating hole measures 877.04 mm and its shaft measures 876.98 mm. What diametral clearance exists?

- A. 0.04 mm
- B. 0.02 mm
- C. 0.06 mm
- D. 0.03 mm

93. Inspection accepts 4745 of 4765 manufactured parts. What is the observed percent yield?

- A. 49.79 %
- B. 99.58 %
- C. 149.37 %
- D. 100.42 %

94. A machining operation reduces a diameter from 886 mm to 882 mm. What percent reduction in diameter occurs?

- A. 0.45 %
- B. 0.72 %
- C. 0.68 %
- D. 0.9 %

95. Four repeated measurements are 58.57, 58.53, 58.56, and 58.54 mm. What is their arithmetic mean?

- A. 29.28 mm

- B. 234.2 mm
- C. 58.57 mm
- D. 58.55 mm

96. A mating hole measures 881.05 mm and its shaft measures 880.98 mm. What diametral clearance exists?

- A. 0.05 mm
- B. 0.02 mm
- C. 0.07 mm
- D. 0.03 mm

97. Inspection accepts 4765 of 4785 manufactured parts. What is the observed percent yield?

- A. 99.58 %
- B. 49.79 %
- C. 149.37 %
- D. 100.42 %

98. A machining operation reduces a diameter from 890 mm to 886 mm. What percent reduction in diameter occurs?

- A. 0.72 %
- B. 0.67 %
- C. 0.9 %
- D. 0.45 %

99. Four repeated measurements are 58.61, 58.57, 58.60, and 58.58 mm. What is their arithmetic mean?

- A. 29.29 mm
- B. 234.36 mm

- C. 58.59 mm
- D. 58.61 mm

100. A mating hole measures 885.06 mm and its shaft measures 884.98 mm. What diametral clearance exists?

- A. 0.06 mm
- B. 0.08 mm
- C. 0.02 mm
- D. 0.04 mm

Practice Exam 6: Answer Key and Explanations

1. C — C — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 10998.2 mm. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically tidy but physically inconsistent

2. B — B — Annual labor savings are first converted to dollars, the stated residual credit is subtracted, and the remaining benefit is distributed evenly across the evaluation life. Substitution gives 2290858.75 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

3. A — A — Average unit cost equals the fixed cost plus the allocated variable cost per unit; costs are combined only after using the common per-unit basis. Substitution gives 35825.52 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

4. D — D — The design factor is the ratio of the expected maximum stress to the allowable design stress, not the inverse or a difference. Substitution gives 3.86 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

5. A — A — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 11049 mm. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically tidy but physically inconsistent

6. C — C — Annual labor savings are first converted to dollars, the stated residual credit is subtracted, and the remaining benefit is distributed evenly across the evaluation life. Substitution gives 3080125 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

7. B — B — Average unit cost equals the fixed cost plus the allocated variable cost per unit; costs are combined only after using the common per-unit basis. Substitution gives 35985.54 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

8. D — D — The design factor is the ratio of the expected maximum stress to the allowable design stress, not the inverse or a difference. Substitution gives 3.86 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

9. D — D — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 11099.8 mm. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically tidy but physically inconsistent

10. C — C — Annual labor savings are first converted to dollars, the stated residual credit is subtracted, and the remaining benefit is distributed evenly across the evaluation life. Substitution gives 2662181.43 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

11. A — A — Average unit cost equals the fixed cost plus the allocated variable cost per unit; costs are combined only after using the common per-unit basis. Substitution gives 36145.56 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

12. B — B — The design factor is the ratio of the expected maximum stress to the allowable design stress, not the inverse or a difference. Substitution gives 3.86 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

13. A — A — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 11150.6 mm. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically tidy but physically inconsistent

14. D — D — Annual labor savings are first converted to dollars, the stated residual credit is subtracted, and the remaining benefit is distributed evenly across the evaluation life. Substitution gives 2348803.75 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

15. B — B — Average unit cost equals the fixed cost plus the allocated variable cost per unit; costs are combined only after using the common per-unit basis. Substitution gives 36305.58 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

16. C — C — The design factor is the ratio of the expected maximum stress to the allowable design stress, not the inverse or a difference. Substitution gives 3.86 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

17. C — C — Using sigma equals $M c$ over I for a rectangle reduces to $6M$ divided by $b h$ squared. The moment must be expressed in newton-millimeters. Substitution gives 0.44 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

18. D — D — Elastic axial elongation follows PL divided by AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 33.57 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign convention,

19. B — B — For a ductile material evaluated by von Mises stress, the yield factor of safety is yield strength divided by equivalent stress. Substitution gives 2.51 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign

20. A — A — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\pi^2 EI$ divided by L^2 . Substitution gives 332.78 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

21. A — A — Plane-stress von Mises stress combines both normal stresses and shear through the distortion-energy expression, including three times shear stress squared. Substitution gives 1735.14 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign convention,

22. D — D — The modified Goodman relation divides alternating stress by endurance limit and mean stress by ultimate strength; their sum equals the reciprocal safety factor. Substitution gives 1.17 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

23. B — B — Average axial stress is force divided by net resisting area. Converting kilonewtons to newtons makes newtons per square millimeter, numerically equal to megapascals. Substitution gives 378.4 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

24. C — C — For a solid circular shaft, maximum shear stress is $16T$ divided by π times diameter cubed. Torque is converted from newton-meters to newton-millimeters. Substitution gives 583.48 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

25. B — B — Using $\sigma = \frac{Mc}{I}$ for a rectangle reduces to $6M$ divided by $b h^2$. The moment must be expressed in newton-millimeters. Substitution gives 0.43 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

26. D — D — Elastic axial elongation follows PL divided by AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 33.89 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign convention,

27. C — C — For a ductile material evaluated by von Mises stress, the yield factor of safety is yield strength divided by equivalent stress. Substitution gives 2.51 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign

28. A — A — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\pi^2 EI$ divided by L^2 . Substitution gives 329.99 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

29. A — A — Plane-stress von Mises stress combines both normal stresses and shear through the distortion-energy expression, including three times shear stress squared. Substitution gives 1750.63 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign convention,

30. D — D — The modified Goodman relation divides alternating stress by endurance limit and mean stress by ultimate strength; their sum equals the reciprocal safety factor. Substitution gives 1.17 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

31. C — C — Average axial stress is force divided by net resisting area. Converting kilonewtons to newtons makes newtons per square millimeter, numerically equal to megapascals. Substitution gives 378.59 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

32. B — B — For a solid circular shaft, maximum shear stress is $16T$ divided by π times diameter cubed. Torque is converted from newton-meters to newton-millimeters. Substitution gives 741.53 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

33. B — B — Using $\sigma = \frac{Mc}{I}$ for a rectangle reduces to $6M$ divided by $b h^2$. The moment must be expressed in newton-millimeters. Substitution gives 0.42 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

34. D — D — Elastic axial elongation follows $\frac{PL}{AE}$. Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 34.2 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign convention,

35. C — C — For a ductile material evaluated by von Mises stress, the yield factor of safety is yield strength divided by equivalent stress. Substitution gives 2.51. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign

36. A — A — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\frac{\pi^2 EI}{L^2}$. Substitution gives 327.26 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

37. A — A — Plane-stress von Mises stress combines both normal stresses and shear through the distortion-energy expression, including three times shear stress squared. Substitution gives 1766.13 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign convention,

38. B — B — The modified Goodman relation divides alternating stress by endurance limit and mean stress by ultimate strength; their sum equals the reciprocal safety factor. Substitution gives 1.17. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

39. C — C — Average axial stress is force divided by net resisting area. Converting kilonewtons to newtons makes newtons per square millimeter, numerically equal to megapascals. Substitution gives 378.77 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

40. D — D — For a solid circular shaft, maximum shear stress is $\frac{16T}{\pi d^3}$. Torque is converted from newton-meters to newton-millimeters. Substitution gives 532.45 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

41. A — A — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 2582.35 kN. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified in

42. D — D — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 43.21 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified in

43. C — C — Equal load sharing divides the applied force among the rivets, and single-shear area is the circular cross-sectional area of one rivet. Substitution gives 3866.14 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting

44. B — B — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 8027.27 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified

45. D — D — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 2450 kN. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified in

46. B — B — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 57.62 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified in

47. A — A — Equal load sharing divides the applied force among the rivets, and single-shear area is the circular cross-sectional area of one rivet. Substitution gives 2853.42 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting

48. C — C — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 7391.67 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified

49. B — B — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 2768.75 kN. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified in

50. C — C — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 49.39 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified in

51. A — A — Equal load sharing divides the applied force among the rivets, and single-shear area is the circular cross-sectional area of one rivet. Substitution gives 2194.6 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting

52. D — D — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 8910 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified

53. B — B — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 2617.65 kN. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified in

54. A — A — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 3534.48 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship help reject the nearby

55. C — C — The stated horsepower-speed relation directly produces torque in inch-pounds; substituting horsepower and rotational speed avoids mixing foot-pounds and inch-pounds. Substitution gives 2995.59 in·lbf. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship help reject the

56. D — D — Equal belt speed at both pulley rims gives $N_1 D_1$ equal to $N_2 D_2$, so driven speed is driver speed times the diameter ratio. Substitution gives 3768 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship

57. A — A — Collar friction torque equals friction coefficient times axial load times mean friction radius; kilonewtons are converted to newtons. Substitution gives 775.58 N·m. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship help reject the nearby

58. B — B — Efficiency is output work divided by input work per revolution. Equating output F times lead to efficiency times 2π torque gives the load. Substitution gives 468.11 kN. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the

59. D — D — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 3605 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship help reject the nearby

60. C — C — The stated horsepower-speed relation directly produces torque in inch-pounds; substituting horsepower and rotational speed avoids mixing foot-pounds and inch-pounds. Substitution gives 2996.44 in·lbf. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship help reject the

61. B — B — Equal belt speed at both pulley rims gives N_1D_1 equal to N_2D_2 , so driven speed is driver speed times the diameter ratio. Substitution gives 3847.19 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship

62. D — D — Collar friction torque equals friction coefficient times axial load times mean friction radius; kilonewtons are converted to newtons. Substitution gives 699.2 N·m. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship help reject the nearby

63. A — A — Efficiency is output work divided by input work per revolution. Equating output F times lead to efficiency times 2π torque gives the load. Substitution gives 553.86 kN. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the

64. C — C — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 3450 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship help reject the nearby

65. A — A — The stated horsepower-speed relation directly produces torque in inch-pounds; substituting horsepower and rotational speed avoids mixing foot-pounds and inch-pounds. Substitution gives 2997.28 in·lbf. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship help reject the

66. B — B — Equal belt speed at both pulley rims gives N_1D_1 equal to N_2D_2 , so driven speed is driver speed times the diameter ratio. Substitution gives 3838.71 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship

67. C — C — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 46.49 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature rounding can shift a close design

68. D — D — For a simply supported beam with a centered point load, reactions are equal and the maximum moment at midspan is PL divided by four. Substitution gives 586.58 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

69. D — D — Moment equilibrium about the fulcrum makes effort times effort arm equal load times load arm, so ideal mechanical advantage is their arm ratio. Substitution gives 1.53 . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding,

70. B — B — Ohm's law gives current as applied voltage divided by resistance. Multiplication gives power-related units, while the inverse ratio has incorrect dimensions. Substitution gives 29.56 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

71. C — C — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 14743.86 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature rounding can

72. A — A — Hooke's law gives spring force as stiffness times deflection. Converting kilonewtons per meter to newtons per meter makes the result newtons. Substitution gives 40480 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

73. D — D — Natural circular frequency is the square root of stiffness divided by mass. Dividing radians per second by 2 pi converts it to cycles per second. Substitution gives 3.62 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

74. C — C — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 46.52 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature rounding can shift a close design

75. B — B — For a simply supported beam with a centered point load, reactions are equal and the maximum moment at midspan is PL divided by four. Substitution gives 569.4 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

76. A — A — Moment equilibrium about the fulcrum makes effort times effort arm equal load times load arm, so ideal mechanical advantage is their arm ratio. Substitution gives 1.53 . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding,

77. B — B — Ohm's law gives current as applied voltage divided by resistance. Multiplication gives power-related units, while the inverse ratio has incorrect dimensions. Substitution gives 44.67 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

78. C — C — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 17467.31 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature rounding can

79. D — D — Hooke's law gives spring force as stiffness times deflection. Converting kilonewtons per meter to newtons per meter makes the result newtons. Substitution gives 39028 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

80. A — A — Natural circular frequency is the square root of stiffness divided by mass. Dividing radians per second by 2π converts it to cycles per second. Substitution gives 3.62 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

81. C — C — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 46.54 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature rounding can shift a close design

82. A — A — For a simply supported beam with a centered point load, reactions are equal and the maximum moment at midspan is PL divided by four. Substitution gives 551.88 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

83. D — D — Moment equilibrium about the fulcrum makes effort times effort arm equal load times load arm, so ideal mechanical advantage is their arm ratio. Substitution gives 1.53 . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding,

84. B — B — Ohm's law gives current as applied voltage divided by resistance. Multiplication gives power-related units, while the inverse ratio has incorrect dimensions. Substitution gives 33.75 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

85. A — A — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 16371.23 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature rounding can

86. B — B — Hooke's law gives spring force as stiffness times deflection. Converting kilonewtons per meter to newtons per meter makes the result newtons. Substitution gives 37548 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

87. D — D — Natural circular frequency is the square root of stiffness divided by mass. Dividing radians per second by 2π converts it to cycles per second. Substitution gives 3.62 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

88. C — C — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 46.57 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature rounding can shift a close design

89. A — A — For a simply supported beam with a centered point load, reactions are equal and the maximum moment at midspan is PL divided by four. Substitution gives 534 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

90. D — D — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.45 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent, and the measurement definition used in the

91. B — B — The arithmetic mean is the sum of all readings divided by their count. Range and total are not estimates of the central measured value. Substitution gives 58.51 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

92. C — C — Diametral clearance is the actual hole diameter minus the actual shaft diameter. Radius differences would give only half the requested diametral value. Substitution gives 0.06 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

93. B — B — Percent yield is accepted quantity divided by total inspected quantity, multiplied by one hundred. The rejected fraction is a different quality metric. Substitution gives 99.58 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

94. A — A — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.45 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent, and the measurement definition used in the

95. D — D — The arithmetic mean is the sum of all readings divided by their count. Range and total are not estimates of the central measured value. Substitution gives 58.55 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

96. C — C — Diametral clearance is the actual hole diameter minus the actual shaft diameter. Radius differences would give only half the requested diametral value. Substitution gives 0.07 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

97. A — A — Percent yield is accepted quantity divided by total inspected quantity, multiplied by one hundred. The rejected fraction is a different quality metric. Substitution gives 99.58 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

98. D — D — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.45 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent, and the measurement definition used in the

99. C — C — The arithmetic mean is the sum of all readings divided by their count. Range and total are not estimates of the central measured value. Substitution gives 58.59 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

100. B — B — Diametral clearance is the actual hole diameter minus the actual shaft diameter. Radius differences would give only half the requested diametral value. Substitution gives 0.08 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,