

PRACTICE EXAM 11: 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 proposed fixture has a fixed fabrication cost of \$69500 and a variable cost of \$862000 spread over 3480 units. What is the average cost per unit?

- A. 34873.85 \$/unit
- B. 76722.47 \$/unit
- C. 139495.4 \$/unit
- D. 69747.7 \$/unit

2. A component is expected to experience 1741 MPa maximum stress, while its allowable design stress is 443.25 MPa. What design factor is implied?

- A. 1.96
- B. 3.93
- C. 4.43
- D. 7.86

3. A drawing dimension is 859.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 10909.3 mm
- B. 32727.9 mm
- C. 21818.6 mm
- D. 21844 mm

4. A machine saves 18830 labor-hours annually at \$3491/h. Ignoring interest, its \$182300 residual value is credited evenly over a 8-year evaluation. What is the annual net benefit?

- A. 8194153.75 \$/year
- B. 4097076.88 \$/year
- C. 8239728.75 \$/year
- D. 16388307.5 \$/year

5. A proposed fixture has a fixed fabrication cost of \$69660 and a variable cost of \$864000 spread over 3488 units. What is the average cost per unit?

- A. 34953.85 \$/unit
- B. 69907.71 \$/unit
- C. 76898.48 \$/unit
- D. 139815.41 \$/unit

6. A component is expected to experience 1745 MPa maximum stress, while its allowable design stress is 444.25 MPa. What design factor is implied?

- A. 1.96
- B. 4.43
- C. 7.86
- D. 3.93

7. A drawing dimension is 861.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 21869.4 mm
- B. 10934.7 mm
- C. 32804.1 mm
- D. 21894.8 mm

8. A machine saves 18870 labor-hours annually at \$3499/h. Ignoring interest, its \$182700 residual value is credited evenly over a 6-year evaluation. What is the annual net benefit?

- A. 5486952.5 \$/year
- B. 11034805 \$/year
- C. 10973905 \$/year
- D. 21947810 \$/year

9. A proposed fixture has a fixed fabrication cost of \$69820 and a variable cost of \$866000 spread over 3496 units. What is the average cost per unit?

- A. 35033.86 \$/unit
- B. 77074.48 \$/unit
- C. 140135.42 \$/unit
- D. 70067.71 \$/unit

10. A component is expected to experience 1749 MPa maximum stress, while its allowable design stress is 445.25 MPa. What design factor is implied?

- A. 1.96
- B. 4.43
- C. 3.93
- D. 7.86

11. A drawing dimension is 863.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 10960.1 mm
- B. 21920.2 mm
- C. 32880.3 mm
- D. 21945.6 mm

12. A machine saves 18910 labor-hours annually at \$3507/h. Ignoring interest, its \$183100 residual value is credited evenly over a 7-year evaluation. What is the annual net benefit?

- A. 9447752.86 \$/year
- B. 4723876.43 \$/year
- C. 9500067.14 \$/year
- D. 18895505.71 \$/year

13. A proposed fixture has a fixed fabrication cost of \$69980 and a variable cost of \$868000 spread over 3504 units. What is the average cost per unit?

- A. 35113.86 \$/unit
- B. 77250.49 \$/unit
- C. 140455.43 \$/unit
- D. 70227.72 \$/unit

14. A component is expected to experience 1753 MPa maximum stress, while its allowable design stress is 446.25 MPa. What design factor is implied?

- A. 1.96
- B. 4.43
- C. 3.93
- D. 7.86

15. A drawing dimension is 865.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 21971 mm
- B. 10985.5 mm
- C. 32956.5 mm
- D. 21996.4 mm

16. A machine saves 18950 labor-hours annually at \$3515/h. Ignoring interest, its \$183500 residual value is credited evenly over a 8-year evaluation. What is the annual net benefit?

- A. 4151609.38 \$/year
- B. 8303218.75 \$/year
- C. 8349093.75 \$/year
- D. 16606437.5 \$/year

17. A ductile member has yield strength 8750 MPa and calculated von Mises stress 3495 MPa. What factor of safety against yielding results?

- A. 2.5
- B. 1.25
- C. 1.5
- D. 3.5

18. A pin-ended column has $E = 200,000$ MPa, $I = 178100000$ mm⁴, and length 44725 mm. What is its Euler critical load?

- A. 703 kN
- B. 175.75 kN
- C. 43.94 kN
- D. 55.94 kN

19. At a point, $\sigma_x = 3484$ MPa, $\sigma_y = 1732$ MPa, and $\tau_{xy} = 876.0$ MPa. What is the von Mises equivalent stress for plane stress?

- A. 3890.77 MPa
- B. 1752 MPa
- C. 1688.63 MPa

D. 3377.27 MPa

20. A part has alternating stress 3516 MPa and mean stress 1773 MPa. With $S_e = 5309$ MPa and $S_{ut} = 9015$ MPa, what Goodman fatigue factor of safety applies?

A. 1.51

B. 5.08

C. 1.16

D. 1.38

21. A prismatic bar carries 3448 kN axial tension over a net area of 8870 mm². What is the average normal stress?

A. 388.73 MPa

B. 194.36 MPa

C. 194.77 MPa

D. 583.09 MPa

22. A solid circular shaft of diameter 50 mm transmits 35000 N·m torque. What is its maximum torsional shear stress?

A. 713.01 MPa

B. 2852.06 MPa

C. 1426.03 MPa

D. 2852.61 MPa

23. A rectangular beam 3492 mm wide and 3552 mm deep carries a maximum bending moment of 865.0 kN·m. What is the extreme-fiber bending stress?

A. 0.06 MPa

B. 0.12 MPa

- C. 0.47 MPa
- D. 0.61 MPa

24. A steel tie, length 35340 mm and area 9035 mm², carries 3464 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 33.87 mm
- B. 135.49 mm
- C. 34.42 mm
- D. 67.75 mm

25. A ductile member has yield strength 8790 MPa and calculated von Mises stress 3511 MPa. What factor of safety against yielding results?

- A. 2.5
- B. 1.25
- C. 1.5
- D. 3.5

26. A pin-ended column has $E = 200,000$ MPa, $I = 178900000$ mm⁴, and length 44925 mm. What is its Euler critical load?

- A. 699.88 kN
- B. 43.74 kN
- C. 174.97 kN
- D. 55.69 kN

27. At a point, $\sigma_x = 3500$ MPa, $\sigma_y = 1740$ MPa, and $\tau_{xy} = 880.0$ MPa. What is the von Mises equivalent stress for plane stress?

- A. 3908.66 MPa

- B. 3392.76 MPa
- C. 1760 MPa
- D. 1696.38 MPa

28. A part has alternating stress 3532 MPa and mean stress 1781 MPa. With $S_e = 5333$ MPa and $S_{ut} = 9055$ MPa, what Goodman fatigue factor of safety applies?

- A. 1.51
- B. 5.08
- C. 1.16
- D. 1.38

29. A prismatic bar carries 3464 kN axial tension over a net area of 8910 mm². What is the average normal stress?

- A. 194.39 MPa
- B. 194.8 MPa
- C. 583.16 MPa
- D. 388.78 MPa

30. A solid circular shaft of diameter 56 mm transmits 35160 N·m torque. What is its maximum torsional shear stress?

- A. 509.83 MPa
- B. 1019.66 MPa
- C. 2039.32 MPa
- D. 2039.87 MPa

31. A rectangular beam 3508 mm wide and 3568 mm deep carries a maximum bending moment of 869.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.06 MPa
- B. 0.47 MPa
- C. 0.61 MPa
- D. 0.12 MPa

32. A steel tie, length 35500 mm and area 9075 mm², carries 3480 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 68.07 mm
- B. 34.03 mm
- C. 136.13 mm
- D. 34.58 mm

33. A ductile member has yield strength 8830 MPa and calculated von Mises stress 3527 MPa. What factor of safety against yielding results?

- A. 1.25
- B. 2.5
- C. 1.5
- D. 3.5

34. A pin-ended column has $E = 200,000$ MPa, $I = 179700000$ mm⁴, and length 45125 mm. What is its Euler critical load?

- A. 174.2 kN
- B. 696.79 kN
- C. 43.55 kN
- D. 55.45 kN

35. At a point, $\sigma_x = 3516$ MPa, $\sigma_y = 1748$ MPa, and $\tau_{xy} = 884.0$ MPa. What is the von Mises equivalent stress for plane stress?

- A. 3926.55 MPa
- B. 1768 MPa
- C. 1704.12 MPa
- D. 3408.25 MPa

36. A part has alternating stress 3548 MPa and mean stress 1789 MPa. With $S_e = 5357$ MPa and $S_{ut} = 9095$ MPa, what Goodman fatigue factor of safety applies?

- A. 1.51
- B. 5.08
- C. 1.16
- D. 1.38

37. A prismatic bar carries 3480 kN axial tension over a net area of 8950 mm². What is the average normal stress?

- A. 194.41 MPa
- B. 194.82 MPa
- C. 583.24 MPa
- D. 388.83 MPa

38. A solid circular shaft of diameter 52 mm transmits 35320 N·m torque. What is its maximum torsional shear stress?

- A. 1279.32 MPa
- B. 639.66 MPa
- C. 2558.65 MPa
- D. 2559.2 MPa

39. A rectangular beam 3524 mm wide and 3584 mm deep carries a maximum bending moment of 873.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.06 MPa
- B. 0.47 MPa
- C. 0.12 MPa
- D. 0.61 MPa

40. A steel tie, length 35660 mm and area 9115 mm², carries 3496 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 34.19 mm
- B. 68.39 mm
- C. 136.77 mm
- D. 34.74 mm

41. A lap joint uses 4 identical 16-mm-diameter rivets in single shear to carry 3445 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 17134.02 MPa
- B. 4283.51 MPa
- C. 2141.75 MPa
- D. 8567.01 MPa

42. A bolt transfers 3462 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. 17310 MPa
- B. 5509.94 MPa
- C. 8655 MPa
- D. 34620 MPa

43. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 17300 N·m, nut factor $K = 0.2$, and nominal diameter is 17 mm.

- A. 5088.51 kN
- B. 7632.35 kN
- C. 5088.24 kN
- D. 1017.65 kN

44. Two parallel fillet welds, each 3486 mm long with 8 mm leg size, carry 1723 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 61.78 MPa
- B. 30.89 MPa
- C. 87.39 MPa
- D. 43.69 MPa

45. A lap joint uses 4 identical 12-mm-diameter rivets in single shear to carry 3453 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 30531.22 MPa
- B. 7632.81 MPa
- C. 3816.4 MPa
- D. 15265.61 MPa

46. A bolt transfers 3470 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. 15772.73 MPa
- B. 5020.62 MPa
- C. 7886.36 MPa
- D. 31545.45 MPa

47. Using the relation $T = KFd$, estimate bolt preload when installation torque is 17340 N·m, nut factor $K = 0.2$, and nominal diameter is 18 mm.

- A. 4816.94 kN
- B. 7225 kN
- C. 963.33 kN
- D. 4816.67 kN

48. Two parallel fillet welds, each 3494 mm long with 6 mm leg size, carry 1727 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 82.38 MPa
- B. 41.19 MPa
- C. 58.26 MPa
- D. 116.52 MPa

49. A lap joint uses 4 identical 14-mm-diameter rivets in single shear to carry 3461 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 22483.07 MPa
- B. 2810.38 MPa
- C. 5620.77 MPa
- D. 11241.54 MPa

50. A bolt transfers 3478 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. 14491.67 MPa
- B. 4612.84 MPa
- C. 7245.83 MPa
- D. 28983.33 MPa

51. Using the relation $T = KFd$, estimate bolt preload when installation torque is 17380 N·m, nut factor $K = 0.2$, and nominal diameter is 16 mm.

- A. 5431.52 kN
- B. 8146.88 kN
- C. 1086.25 kN
- D. 5431.25 kN

52. Two parallel fillet welds, each 3502 mm long with 7 mm leg size, carry 1731 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 70.61 MPa
- B. 49.94 MPa
- C. 35.31 MPa
- D. 99.88 MPa

53. A lap joint uses 4 identical 16-mm-diameter rivets in single shear to carry 3469 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 17253.39 MPa
- B. 4313.35 MPa
- C. 2156.67 MPa
- D. 8626.7 MPa

54. A 18-tooth pinion rotating at 18750 rpm drives a 54-tooth gear. Neglecting slip, what is the gear speed?

- A. 3125 rpm
- B. 12500 rpm
- C. 6250 rpm
- D. 18750 rpm

55. A shaft transmits 1716 hp at 35220 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 3070.72 in·lbf
- B. 1535.36 in·lbf
- C. 4606.09 in·lbf
- D. 6141.45 in·lbf

56. An open belt connects a 125-mm driver at 17920 rpm to a 310-mm driven pulley. Neglecting slip, what is driven speed?

- A. 3612.9 rpm
- B. 10694.19 rpm
- C. 17920 rpm
- D. 7225.81 rpm

57. A collar bearing supports 859.5 kN at mean friction radius 0.022 m with friction coefficient 0.090. What friction torque must be overcome?

- A. 3403.62 N·m
- B. 2552.72 N·m
- C. 3404.17 N·m
- D. 1701.81 N·m

58. A power screw has lead 6 mm, input torque 3453 N·m, and raising efficiency 0.32. What axial load can it raise?

- A. 578.56 kN
- B. 1735.67 kN
- C. 1157.11 kN
- D. 2314.22 kN

59. A 19-tooth pinion rotating at 18800 rpm drives a 56-tooth gear. Neglecting slip, what is the gear speed?

- A. 6378.57 rpm
- B. 3189.29 rpm
- C. 12421.43 rpm
- D. 18800 rpm

60. A shaft transmits 1721 hp at 35320 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1535.48 in·lbf
- B. 3070.95 in·lbf
- C. 4606.43 in·lbf
- D. 6141.9 in·lbf

61. An open belt connects a 120-mm driver at 17970 rpm to a 300-mm driven pulley. Neglecting slip, what is driven speed?

- A. 3594 rpm
- B. 10782 rpm
- C. 7188 rpm
- D. 17970 rpm

62. A collar bearing supports 862.0 kN at mean friction radius 0.021 m with friction coefficient 0.085. What friction torque must be overcome?

- A. 3077.34 N·m
- B. 2308.01 N·m
- C. 3077.89 N·m
- D. 1538.67 N·m

63. A power screw has lead 8 mm, input torque 3463 N·m, and raising efficiency 0.33. What axial load can it raise?

- A. 448.77 kN
- B. 897.55 kN
- C. 1346.32 kN
- D. 1795.09 kN

64. A 20-tooth pinion rotating at 18850 rpm drives a 58-tooth gear. Neglecting slip, what is the gear speed?

- A. 6500 rpm
- B. 3250 rpm
- C. 12350 rpm
- D. 18850 rpm

65. A shaft transmits 1726 hp at 35420 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1535.59 in·lbf
- B. 4606.77 in·lbf
- C. 3071.18 in·lbf
- D. 6142.36 in·lbf

66. An open belt connects a 130-mm driver at 18020 rpm to a 320-mm driven pulley. Neglecting slip, what is driven speed?

- A. 7320.62 rpm
- B. 3660.31 rpm
- C. 10699.38 rpm
- D. 18020 rpm

67. A 508-V DC source is applied across a 6- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 42.33 A
- B. 84.67 A
- C. 127 A
- D. 169.33 A

68. A thin-walled cylindrical vessel has internal pressure 173.1 MPa, inside diameter 8905 mm, and wall thickness 12 mm. What is the membrane hoop stress?

- A. 32113.66 MPa
- B. 128454.63 MPa
- C. 32114.21 MPa
- D. 64227.31 MPa

69. A linear spring has stiffness 1727 kN/m and is compressed 44 mm. What force does it exert?

- A. 37994 N
- B. 113982 N
- C. 37994.55 N
- D. 75988 N

70. An undamped single-degree system has mass 1721 kg and stiffness 875500 N/m. What is its natural frequency in hertz?

- A. 1.79 Hz
- B. 5.38 Hz
- C. 3.59 Hz
- D. 7.18 Hz

71. A hydraulic cylinder must produce 864.0 kN using a piston area of 17940 mm². Neglecting losses, what gauge pressure is required?

- A. 24.08 MPa
- B. 48.16 MPa
- C. 24.49 MPa
- D. 96.32 MPa

72. A simply supported beam of span 2.5 m carries a central point load of 1723 kN. What is the maximum bending moment?

- A. 1076.88 kN·m
- B. 2153.75 kN·m
- C. 538.44 kN·m
- D. 689.2 kN·m

73. A lever has an effort arm of 5238 mm and a load arm of 3452 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 1.52
- C. 2.28
- D. 3.03

74. A 510-V DC source is applied across a 8- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 31.88 A
- B. 95.62 A
- C. 127.5 A
- D. 63.75 A

75. A thin-walled cylindrical vessel has internal pressure 173.8 MPa, inside diameter 8940 mm, and wall thickness 13 mm. What is the membrane hoop stress?

- A. 29880.23 MPa
- B. 119520.92 MPa
- C. 59760.46 MPa
- D. 29880.78 MPa

76. A linear spring has stiffness 1734 kN/m and is compressed 42 mm. What force does it exert?

- A. 72828 N
- B. 36414 N
- C. 109242 N
- D. 36414.55 N

77. An undamped single-degree system has mass 1728 kg and stiffness 879000 N/m. What is its natural frequency in hertz?

- A. 1.79 Hz
- B. 3.59 Hz
- C. 5.38 Hz
- D. 7.18 Hz

78. A hydraulic cylinder must produce 867.5 kN using a piston area of 18010 mm². Neglecting losses, what gauge pressure is required?

- A. 48.17 MPa
- B. 24.08 MPa
- C. 24.49 MPa
- D. 96.34 MPa

79. A simply supported beam of span 2.4 m carries a central point load of 1730 kN. What is the maximum bending moment?

- A. 2076 kN·m
- B. 519 kN·m
- C. 720.83 kN·m
- D. 1038 kN·m

80. A lever has an effort arm of 5259 mm and a load arm of 3466 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 2.28
- C. 1.52
- D. 3.03

81. A 512-V DC source is applied across a 10- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 25.6 A
- B. 76.8 A
- C. 51.2 A
- D. 102.4 A

82. A thin-walled cylindrical vessel has internal pressure 174.5 MPa, inside diameter 8975 mm, and wall thickness 14 mm. What is the membrane hoop stress?

- A. 55933.48 MPa
- B. 27966.74 MPa
- C. 111866.96 MPa
- D. 27967.29 MPa

83. A linear spring has stiffness 1741 kN/m and is compressed 40 mm. What force does it exert?

- A. 34820 N
- B. 69640 N
- C. 104460 N
- D. 34820.55 N

84. An undamped single-degree system has mass 1735 kg and stiffness 882500 N/m. What is its natural frequency in hertz?

- A. 1.79 Hz
- B. 5.38 Hz
- C. 7.18 Hz
- D. 3.59 Hz

85. A hydraulic cylinder must produce 871.0 kN using a piston area of 18080 mm². Neglecting losses, what gauge pressure is required?

- A. 24.09 MPa
- B. 48.17 MPa
- C. 24.5 MPa
- D. 96.35 MPa

86. A simply supported beam of span 2.7 m carries a central point load of 1737 kN. What is the maximum bending moment?

- A. 2344.95 kN·m
- B. 586.24 kN·m
- C. 1172.48 kN·m
- D. 643.33 kN·m

87. A lever has an effort arm of 5280 mm and a load arm of 3480 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 2.28
- C. 3.03
- D. 1.52

88. A 514-V DC source is applied across a 7- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 73.43 A
- B. 36.71 A
- C. 110.14 A
- D. 146.86 A

89. A thin-walled cylindrical vessel has internal pressure 175.2 MPa, inside diameter 9010 mm, and wall thickness 12 mm. What is the membrane hoop stress?

- A. 32886.5 MPa
- B. 131546 MPa
- C. 32887.05 MPa
- D. 65773 MPa

90. A mating hole measures 1725.06 mm and its shaft measures 1724.98 mm. What diametral clearance exists?

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

91. Inspection accepts 8985 of 9005 manufactured parts. What is the observed percent yield?

- A. 49.89 %
- B. 99.78 %
- C. 149.67 %
- D. 100.22 %

92. A machining operation reduces a diameter from 1734 mm to 1730 mm. What percent reduction in diameter occurs?

- A. 0.23 %
- B. 0.5 %
- C. 0.35 %
- D. 0.46 %

93. Four repeated measurements are 67.05, 67.01, 67.04, and 67.02 mm. What is their arithmetic mean?

- A. 67.03 mm
- B. 33.52 mm
- C. 268.12 mm
- D. 67.05 mm

94. A mating hole measures 1729.04 mm and its shaft measures 1728.98 mm. What diametral clearance exists?

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

95. Inspection accepts 9005 of 9025 manufactured parts. What is the observed percent yield?

- A. 49.89 %

- B. 149.67 %
- C. 100.22 %
- D. 99.78 %

96. A machining operation reduces a diameter from 1738 mm to 1734 mm. What percent reduction in diameter occurs?

- A. 0.5 %
- B. 0.35 %
- C. 0.23 %
- D. 0.46 %

97. Four repeated measurements are 67.09, 67.05, 67.08, and 67.06 mm. What is their arithmetic mean?

- A. 67.07 mm
- B. 33.53 mm
- C. 268.28 mm
- D. 67.09 mm

98. A mating hole measures 1733.05 mm and its shaft measures 1732.98 mm. What diametral clearance exists?

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

99. Inspection accepts 9025 of 9045 manufactured parts. What is the observed percent yield?

- A. 49.89 %
- B. 149.67 %

- C. 99.78 %
- D. 100.22 %

100. A machining operation reduces a diameter from 1742 mm to 1738 mm. What percent reduction in diameter occurs?

- A. 0.5 %
- B. 0.34 %
- C. 0.46 %
- D. 0.23 %

Practice Exam 11: Answer Key and Explanations

1. D — D — 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 69747.7 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

2. 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 3.93 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

3. C — C — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 21818.6 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

4. A — A — 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 8194153.75 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

5. 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 69907.71 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

- 6. 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 3.93 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically
- 7. A — A —** Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 21869.4 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
- 8. 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 10973905 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis
- 9. D — D —** 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 70067.71 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents
- 10. 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 3.93 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically
- 11. B — B —** Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 21920.2 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
- 12. A — A —** 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 9447752.86 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis
- 13. D — D —** 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 70227.72 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents
- 14. 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 3.93 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

15. A — A — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 21971 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

16. 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 8303218.75 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

17. A — A — For a ductile material evaluated by von Mises stress, the yield factor of safety is yield strength divided by equivalent stress. Substitution gives 2.5 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign

18. B — B — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\pi^2 EI$ divided by L^2 . Substitution gives 175.75 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

19. D — D — Plane-stress von Mises stress combines both normal stresses and shear through the distortion-energy expression, including three times shear stress squared. Substitution gives 3377.27 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,

20. C — C — 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 1.16 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

21. A — A — 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 388.73 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

22. 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 1426.03 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

23. B — B — Using $\sigma = Mc/I$ for a rectangle reduces to $6M$ divided by $b h^2$. The moment must be expressed in newton-millimeters. Substitution gives 0.12 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

24. D — D — Elastic axial elongation follows PL divided by AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 67.75 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,

25. A — A — For a ductile material evaluated by von Mises stress, the yield factor of safety is yield strength divided by equivalent stress. Substitution gives 2.5 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign

26. C — C — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\pi^2 EI$ divided by L^2 . Substitution gives 174.97 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

27. B — B — Plane-stress von Mises stress combines both normal stresses and shear through the distortion-energy expression, including three times shear stress squared. Substitution gives 3392.76 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,

28. C — C — 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 1.16 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

29. D — D — 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 388.78 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

30. 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 1019.66 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

31. D — D — Using $\sigma = Mc/I$ for a rectangle reduces to $6M$ divided by $b h^2$. The moment must be expressed in newton-millimeters. Substitution gives 0.12 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

32. A — A — Elastic axial elongation follows PL divided by AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 68.07 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,

33. 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 2.5 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign

34. 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 174.2 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

35. D — D — Plane-stress von Mises stress combines both normal stresses and shear through the distortion-energy expression, including three times shear stress squared. Substitution gives 3408.25 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,

36. C — C — 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 1.16 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

37. D — D — 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 388.83 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

38. A — A — 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 1279.32 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

39. C — C — Using $\sigma = Mc/I$ for a rectangle reduces to $6M$ divided by $b h^2$. The moment must be expressed in newton-millimeters. Substitution gives 0.12 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

40. B — B — Elastic axial elongation follows PL/AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 68.39 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,

41. B — B — 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 4283.51 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting

42. A — A — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 17310 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

43. C — C — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 5088.24 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

44. D — D — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 43.69 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

45. B — B — 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 7632.81 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting

46. A — A — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 15772.73 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

47. D — D — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 4816.67 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

48. C — C — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 58.26 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

49. 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 5620.77 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting

50. A — A — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 14491.67 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

51. D — D — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 5431.25 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

52. B — B — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 49.94 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

53. B — B — 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 4313.35 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting

54. C — C — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 6250 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. 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 3070.72 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 7225.81 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship

57. D — D — Collar friction torque equals friction coefficient times axial load times mean friction radius; kilonewtons are converted to newtons. Substitution gives 1701.81 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. C — C — 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 1157.11 kN. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the

59. A — A — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 6378.57 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. B — B — 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 3070.95 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. C — C — 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 7188 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 1538.67 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. 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 897.55 kN. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the

64. A — A — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 6500 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. 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 3071.18 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. A — A — 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 7320.62 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship

67. 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 84.67 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

68. D — D — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 64227.31 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

69. 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 75988 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

70. C — C — 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 3.59 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

71. B — B — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 48.16 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

72. 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 1076.88 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

73. B — B — 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 1.52. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding,

74. D — D — 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 63.75 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

75. C — C — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 59760.46 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

76. 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 72828 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

77. B — B — 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 3.59 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

78. A — A — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 48.17 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

79. 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 1038 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

80. C — C — 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 1.52 . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding,

81. C — C — 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 51.2 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

82. A — A — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 55933.48 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

83. 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 69640 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

84. 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 3.59 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

85. B — B — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 48.17 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

86. C — C — 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 1172.48 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

87. 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 1.52 . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding,

88. A — A — 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 73.43 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

89. D — D — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 65773 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

90. 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 0.08 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

91. 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 99.78 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

92. A — A — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.23 %. 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

93. A — A — 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 67.03 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

94. 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 0.06 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

95. D — D — Percent yield is accepted quantity divided by total inspected quantity, multiplied by one hundred. The rejected fraction is a different quality metric. Substitution gives 99.78 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

96. C — C — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.23 %. 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

97. A — A — 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 67.07 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

98. 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 0.07 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

99. C — C — Percent yield is accepted quantity divided by total inspected quantity, multiplied by one hundred. The rejected fraction is a different quality metric. Substitution gives 99.78 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

100. D — D — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.23 %. 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