

PRACTICE EXAM 10: 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 773.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 9817.1 mm
- B. 29451.3 mm
- C. 19634.2 mm
- D. 19659.6 mm

2. A machine saves 17110 labor-hours annually at \$3147/h. Ignoring interest, its \$165100 residual value is credited evenly over a 7-year evaluation. What is the annual net benefit?

- A. 3834290.71 \$/year
- B. 7668581.43 \$/year
- C. 7715752.86 \$/year
- D. 15337162.86 \$/year

3. A proposed fixture has a fixed fabrication cost of \$62780 and a variable cost of \$778000 spread over 3144 units. What is the average cost per unit?

- A. 63027.46 \$/unit
- B. 31513.73 \$/unit
- C. 69330.2 \$/unit
- D. 126054.91 \$/unit

4. A component is expected to experience 1573 MPa maximum stress, while its allowable design stress is 401.25 MPa. What design factor is implied?

- A. 1.96
- B. 4.42
- C. 7.84
- D. 3.92

5. A drawing dimension is 775.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 19685 mm
- B. 9842.5 mm
- C. 29527.5 mm
- D. 19710.4 mm

6. A machine saves 17150 labor-hours annually at \$3155/h. Ignoring interest, its \$165500 residual value is credited evenly over a 8-year evaluation. What is the annual net benefit?

- A. 3371421.88 \$/year
- B. 6784218.75 \$/year
- C. 13485687.5 \$/year
- D. 6742843.75 \$/year

7. A proposed fixture has a fixed fabrication cost of \$62940 and a variable cost of \$780000 spread over 3152 units. What is the average cost per unit?

- A. 31593.73 \$/unit
- B. 63187.46 \$/unit
- C. 69506.21 \$/unit
- D. 126374.92 \$/unit

8. A component is expected to experience 1577 MPa maximum stress, while its allowable design stress is 402.25 MPa. What design factor is implied?

- A. 1.96
- B. 4.42
- C. 3.92
- D. 7.84

9. A drawing dimension is 777.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 9867.9 mm
- B. 19735.8 mm
- C. 29603.7 mm
- D. 19761.2 mm

10. A machine saves 17190 labor-hours annually at \$3163/h. Ignoring interest, its \$165900 residual value is credited evenly over a 6-year evaluation. What is the annual net benefit?

- A. 9034345 \$/year
- B. 4517172.5 \$/year
- C. 9089645 \$/year
- D. 18068690 \$/year

11. A proposed fixture has a fixed fabrication cost of \$63100 and a variable cost of \$782000 spread over 3160 units. What is the average cost per unit?

- A. 31673.73 \$/unit
- B. 69682.22 \$/unit
- C. 126694.94 \$/unit
- D. 63347.47 \$/unit

12. A component is expected to experience 1581 MPa maximum stress, while its allowable design stress is 403.25 MPa. What design factor is implied?

- A. 1.96
- B. 4.42
- C. 3.92
- D. 7.84

13. A drawing dimension is 779.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 9893.3 mm
- B. 19786.6 mm
- C. 29679.9 mm
- D. 19812 mm

14. A machine saves 17230 labor-hours annually at \$3171/h. Ignoring interest, its \$166300 residual value is credited evenly over a 7-year evaluation. What is the annual net benefit?

- A. 7781432.86 \$/year
- B. 3890716.43 \$/year
- C. 7828947.14 \$/year
- D. 15562865.71 \$/year

15. A proposed fixture has a fixed fabrication cost of \$63260 and a variable cost of \$784000 spread over 3168 units. What is the average cost per unit?

- A. 31753.74 \$/unit
- B. 69858.22 \$/unit
- C. 63507.47 \$/unit
- D. 127014.95 \$/unit

16. A component is expected to experience 1585 MPa maximum stress, while its allowable design stress is 404.25 MPa. What design factor is implied?

- A. 1.96
- B. 4.42
- C. 7.84
- D. 3.92

17. A rectangular beam 3140 mm wide and 3200 mm deep carries a maximum bending moment of 777.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.14 MPa
- B. 0.07 MPa
- C. 0.48 MPa
- D. 0.62 MPa

18. A steel tie, length 31820 mm and area 8155 mm², carries 3112 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 30.36 mm
- B. 121.43 mm
- C. 30.91 mm
- D. 60.71 mm

19. A ductile member has yield strength 7910 MPa and calculated von Mises stress 3159 MPa. What factor of safety against yielding results?

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

D. 3.5

20. A pin-ended column has $E = 200,000 \text{ MPa}$, $I = 161300000 \text{ mm}^4$, and length 40525 mm . What is its Euler critical load?

A. 775.49 kN

B. 193.87 kN

C. 48.47 kN

D. 61.71 kN

21. At a point, $\sigma_x = 3148 \text{ MPa}$, $\sigma_y = 1564 \text{ MPa}$, and $\tau_{xy} = 792.0 \text{ MPa}$. What is the von Mises equivalent stress for plane stress?

A. 3515.11 MPa

B. 1584 MPa

C. 1525.97 MPa

D. 3051.94 MPa

22. A part has alternating stress 3180 MPa and mean stress 1605 MPa . With $S_e = 4805 \text{ MPa}$ and $S_{ut} = 8175 \text{ MPa}$, what Goodman fatigue factor of safety applies?

A. 1.51

B. 1.17

C. 5.09

D. 1.38

23. A prismatic bar carries 3112 kN axial tension over a net area of 8030 mm^2 . What is the average normal stress?

A. 387.55 MPa

B. 193.77 MPa

- C. 194.18 MPa
- D. 581.32 MPa

24. A solid circular shaft of diameter 54 mm transmits 31640 N·m torque. What is its maximum torsional shear stress?

- A. 511.68 MPa
- B. 2046.71 MPa
- C. 1023.35 MPa
- D. 2047.26 MPa

25. A rectangular beam 3156 mm wide and 3216 mm deep carries a maximum bending moment of 781.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.07 MPa
- B. 0.14 MPa
- C. 0.48 MPa
- D. 0.62 MPa

26. A steel tie, length 31980 mm and area 8195 mm², carries 3128 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 30.52 mm
- B. 122.07 mm
- C. 61.03 mm
- D. 31.07 mm

27. A ductile member has yield strength 7950 MPa and calculated von Mises stress 3175 MPa. What factor of safety against yielding results?

- A. 2.5

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

28. A pin-ended column has $E = 200,000 \text{ MPa}$, $I = 162100000 \text{ mm}^4$, and length 40725 mm . What is its Euler critical load?

- A. 771.7 kN
- B. 48.23 kN
- C. 61.41 kN
- D. 192.93 kN

29. At a point, $\sigma_x = 3164 \text{ MPa}$, $\sigma_y = 1572 \text{ MPa}$, and $\tau_{xy} = 796.0 \text{ MPa}$. What is the von Mises equivalent stress for plane stress?

- A. 3533 MPa
- B. 1592 MPa
- C. 1533.71 MPa
- D. 3067.43 MPa

30. A part has alternating stress 3196 MPa and mean stress 1613 MPa . With $S_e = 4829 \text{ MPa}$ and $S_{ut} = 8215 \text{ MPa}$, what Goodman fatigue factor of safety applies?

- A. 1.51
- B. 5.09
- C. 1.17
- D. 1.38

31. A prismatic bar carries 3128 kN axial tension over a net area of 8070 mm^2 . What is the average normal stress?

- A. 193.8 MPa
- B. 387.61 MPa
- C. 194.21 MPa
- D. 581.41 MPa

32. A solid circular shaft of diameter 50 mm transmits 31800 N·m torque. What is its maximum torsional shear stress?

- A. 1295.65 MPa
- B. 647.82 MPa
- C. 2591.3 MPa
- D. 2591.85 MPa

33. A rectangular beam 3172 mm wide and 3232 mm deep carries a maximum bending moment of 785.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.14 MPa
- B. 0.07 MPa
- C. 0.48 MPa
- D. 0.62 MPa

34. A steel tie, length 32140 mm and area 8235 mm², carries 3144 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 30.68 mm
- B. 122.71 mm
- C. 31.23 mm
- D. 61.35 mm

35. A ductile member has yield strength 7990 MPa and calculated von Mises stress 3191 MPa. What factor of safety against yielding results?

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

36. A pin-ended column has $E = 200,000 \text{ MPa}$, $I = 162900000 \text{ mm}^4$, and length 40925 mm . What is its Euler critical load?

- A. 767.95 kN
- B. 191.99 kN
- C. 48 kN
- D. 61.11 kN

37. At a point, $\sigma_x = 3180 \text{ MPa}$, $\sigma_y = 1580 \text{ MPa}$, and $\tau_{xy} = 800.0 \text{ MPa}$. What is the von Mises equivalent stress for plane stress?

- A. 3550.89 MPa
- B. 3082.92 MPa
- C. 1600 MPa
- D. 1541.46 MPa

38. A part has alternating stress 3212 MPa and mean stress 1621 MPa . With $S_e = 4853 \text{ MPa}$ and $S_{ut} = 8255 \text{ MPa}$, what Goodman fatigue factor of safety applies?

- A. 1.51
- B. 5.09
- C. 1.17
- D. 1.38

39. A prismatic bar carries 3144 kN axial tension over a net area of 8110 mm^2 . What is the average normal stress?

- A. 387.67 MPa
- B. 193.83 MPa
- C. 194.24 MPa
- D. 581.5 MPa

40. A solid circular shaft of diameter 56 mm transmits 31960 N·m torque. What is its maximum torsional shear stress?

- A. 463.43 MPa
- B. 1853.71 MPa
- C. 1854.26 MPa
- D. 926.86 MPa

41. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 15580 N·m, nut factor $K = 0.2$, and nominal diameter is 16 mm.

- A. 4869.02 kN
- B. 7303.12 kN
- C. 4868.75 kN
- D. 973.75 kN

42. Two parallel fillet welds, each 3142 mm long with 7 mm leg size, carry 1551 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 70.52 MPa
- B. 35.26 MPa
- C. 99.74 MPa
- D. 49.87 MPa

43. A lap joint uses 4 identical 16-mm-diameter rivets in single shear to carry 3109 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 15462.9 MPa
- B. 3865.72 MPa
- C. 1932.86 MPa
- D. 7731.45 MPa

44. A bolt transfers 3126 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. 15630 MPa
- B. 4975.18 MPa
- C. 7815 MPa
- D. 31260 MPa

45. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 15620 N·m, nut factor $K = 0.2$, and nominal diameter is 17 mm.

- A. 4594.39 kN
- B. 4594.12 kN
- C. 6891.18 kN
- D. 918.82 kN

46. Two parallel fillet welds, each 3150 mm long with 8 mm leg size, carry 1555 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 43.64 MPa
- B. 61.71 MPa
- C. 30.85 MPa
- D. 87.28 MPa

47. A lap joint uses 4 identical 12-mm-diameter rivets in single shear to carry 3117 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 27560.33 MPa
- B. 3445.04 MPa
- C. 13780.17 MPa
- D. 6890.08 MPa

48. A bolt transfers 3134 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. 4534.47 MPa
- B. 7122.73 MPa
- C. 14245.45 MPa
- D. 28490.91 MPa

49. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 15660 N·m, nut factor $K = 0.2$, and nominal diameter is 18 mm.

- A. 4350 kN
- B. 4350.27 kN
- C. 6525 kN
- D. 870 kN

50. Two parallel fillet welds, each 3158 mm long with 6 mm leg size, carry 1559 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 82.28 MPa
- B. 58.19 MPa
- C. 41.14 MPa
- D. 116.38 MPa

51. A lap joint uses 4 identical 14-mm-diameter rivets in single shear to carry 3125 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 20300.38 MPa
- B. 2537.55 MPa
- C. 10150.19 MPa
- D. 5075.09 MPa

52. A bolt transfers 3142 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. 4167.21 MPa
- B. 6545.83 MPa
- C. 13091.67 MPa
- D. 26183.33 MPa

53. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 15700 N·m, nut factor $K = 0.2$, and nominal diameter is 16 mm.

- A. 4906.25 kN
- B. 4906.52 kN
- C. 7359.38 kN
- D. 981.25 kN

54. A 20-tooth pinion rotating at 17050 rpm drives a 58-tooth gear. Neglecting slip, what is the gear speed?

- A. 2939.66 rpm
- B. 11170.69 rpm
- C. 5879.31 rpm
- D. 17050 rpm

55. A shaft transmits 1546 hp at 31820 rpm. Using $T(\text{in} \cdot \text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1531.06 in·lbf
- B. 3062.12 in·lbf
- C. 4593.18 in·lbf
- D. 6124.24 in·lbf

56. An open belt connects a 130-mm driver at 16220 rpm to a 320-mm driven pulley. Neglecting slip, what is driven speed?

- A. 3294.69 rpm
- B. 9630.62 rpm
- C. 16220 rpm
- D. 6589.38 rpm

57. A collar bearing supports 774.5 kN at mean friction radius 0.020 m with friction coefficient 0.080. What friction torque must be overcome?

- A. 2478.4 N·m
- B. 1858.8 N·m
- C. 1239.2 N·m
- D. 2478.95 N·m

58. A power screw has lead 7 mm, input torque 3113 N·m, and raising efficiency 0.34. What axial load can it raise?

- A. 950.04 kN
- B. 475.02 kN
- C. 1425.05 kN
- D. 1900.07 kN

59. A 21-tooth pinion rotating at 17100 rpm drives a 60-tooth gear. Neglecting slip, what is the gear speed?

- A. 2992.5 rpm
- B. 11115 rpm
- C. 17100 rpm
- D. 5985 rpm

60. A shaft transmits 1551 hp at 31920 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1531.2 in·lbf
- B. 3062.4 in·lbf
- C. 4593.6 in·lbf
- D. 6124.8 in·lbf

61. An open belt connects a 125-mm driver at 16270 rpm to a 310-mm driven pulley. Neglecting slip, what is driven speed?

- A. 3280.24 rpm
- B. 9709.52 rpm
- C. 6560.48 rpm
- D. 16270 rpm

62. A collar bearing supports 777.0 kN at mean friction radius 0.022 m with friction coefficient 0.090. What friction torque must be overcome?

- A. 3076.92 N·m
- B. 1538.46 N·m
- C. 2307.69 N·m
- D. 3077.47 N·m

63. A power screw has lead 6 mm, input torque 3123 N·m, and raising efficiency 0.35. What axial load can it raise?

- A. 1144.64 kN
- B. 572.32 kN
- C. 1716.96 kN
- D. 2289.28 kN

64. A 18-tooth pinion rotating at 17150 rpm drives a 54-tooth gear. Neglecting slip, what is the gear speed?

- A. 2858.33 rpm
- B. 11433.33 rpm
- C. 17150 rpm
- D. 5716.67 rpm

65. A shaft transmits 1556 hp at 32020 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1531.34 in·lbf
- B. 3062.68 in·lbf
- C. 4594.01 in·lbf
- D. 6125.35 in·lbf

66. An open belt connects a 120-mm driver at 16320 rpm to a 300-mm driven pulley. Neglecting slip, what is driven speed?

- A. 6528 rpm
- B. 3264 rpm
- C. 9792 rpm
- D. 16320 rpm

67. A simply supported beam of span 2.6 m carries a central point load of 1548 kN. What is the maximum bending moment?

- A. 2012.4 kN·m
- B. 503.1 kN·m
- C. 1006.2 kN·m
- D. 595.38 kN·m

68. A lever has an effort arm of 4713 mm and a load arm of 3102 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 2.28
- C. 3.04
- D. 1.52

69. A 460-V DC source is applied across a 8- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 28.75 A
- B. 86.25 A
- C. 115 A
- D. 57.5 A

70. A thin-walled cylindrical vessel has internal pressure 156.3 MPa, inside diameter 8065 mm, and wall thickness 12 mm. What is the membrane hoop stress?

- A. 26261.66 MPa
- B. 105046.62 MPa
- C. 52523.31 MPa
- D. 26262.21 MPa

71. A linear spring has stiffness 1559 kN/m and is compressed 44 mm. What force does it exert?

- A. 34298 N
- B. 68596 N
- C. 102894 N
- D. 34298.55 N

72. An undamped single-degree system has mass 1553 kg and stiffness 791500 N/m. What is its natural frequency in hertz?

- A. 3.59 Hz
- B. 1.8 Hz
- C. 5.39 Hz
- D. 7.19 Hz

73. A hydraulic cylinder must produce 780.0 kN using a piston area of 16260 mm². Neglecting losses, what gauge pressure is required?

- A. 47.97 MPa
- B. 23.99 MPa
- C. 24.4 MPa
- D. 95.94 MPa

74. A simply supported beam of span 2.5 m carries a central point load of 1555 kN. What is the maximum bending moment?

- A. 1943.75 kN·m
- B. 485.94 kN·m
- C. 971.88 kN·m
- D. 622 kN·m

75. A lever has an effort arm of 4734 mm and a load arm of 3116 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 1.52
- C. 2.28
- D. 3.04

76. A 462-V DC source is applied across a 10- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 23.1 A
- B. 69.3 A
- C. 92.4 A
- D. 46.2 A

77. A thin-walled cylindrical vessel has internal pressure 157.0 MPa, inside diameter 8100 mm, and wall thickness 13 mm. What is the membrane hoop stress?

- A. 24455.77 MPa
- B. 97823.08 MPa
- C. 48911.54 MPa
- D. 24456.32 MPa

78. A linear spring has stiffness 1566 kN/m and is compressed 42 mm. What force does it exert?

- A. 32886 N
- B. 65772 N
- C. 98658 N
- D. 32886.55 N

79. An undamped single-degree system has mass 1560 kg and stiffness 795000 N/m. What is its natural frequency in hertz?

- A. 3.59 Hz
- B. 1.8 Hz
- C. 5.39 Hz
- D. 7.19 Hz

80. A hydraulic cylinder must produce 783.5 kN using a piston area of 16330 mm². Neglecting losses, what gauge pressure is required?

- A. 23.99 MPa
- B. 24.4 MPa
- C. 95.96 MPa
- D. 47.98 MPa

81. A simply supported beam of span 2.4 m carries a central point load of 1562 kN. What is the maximum bending moment?

- A. 1874.4 kN·m
- B. 468.6 kN·m
- C. 937.2 kN·m
- D. 650.83 kN·m

82. A lever has an effort arm of 4755 mm and a load arm of 3130 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 1.52
- C. 2.28
- D. 3.04

83. A 464-V DC source is applied across a 7- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 33.14 A
- B. 99.43 A
- C. 132.57 A
- D. 66.29 A

84. A thin-walled cylindrical vessel has internal pressure 157.7 MPa, inside diameter 8135 mm, and wall thickness 14 mm. What is the membrane hoop stress?

- A. 45817.48 MPa
- B. 22908.74 MPa
- C. 91634.96 MPa
- D. 22909.29 MPa

85. A linear spring has stiffness 1573 kN/m and is compressed 40 mm. What force does it exert?

- A. 31460 N
- B. 62920 N
- C. 94380 N
- D. 31460.55 N

86. An undamped single-degree system has mass 1567 kg and stiffness 798500 N/m. What is its natural frequency in hertz?

- A. 3.59 Hz
- B. 1.8 Hz
- C. 5.39 Hz
- D. 7.19 Hz

87. A hydraulic cylinder must produce 787.0 kN using a piston area of 16400 mm². Neglecting losses, what gauge pressure is required?

- A. 23.99 MPa
- B. 24.4 MPa
- C. 47.99 MPa
- D. 95.98 MPa

88. A simply supported beam of span 2.7 m carries a central point load of 1569 kN. What is the maximum bending moment?

- A. 2118.15 kN·m
- B. 529.54 kN·m
- C. 581.11 kN·m
- D. 1059.08 kN·m

89. A lever has an effort arm of 4776 mm and a load arm of 3144 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 2.28
- C. 1.52
- D. 3.04

90. A machining operation reduces a diameter from 1562 mm to 1558 mm. What percent reduction in diameter occurs?

- A. 0.53 %
- B. 0.26 %
- C. 0.38 %
- D. 0.51 %

91. Four repeated measurements are 65.33, 65.29, 65.32, and 65.30 mm. What is their arithmetic mean?

- A. 32.66 mm
- B. 261.24 mm
- C. 65.33 mm
- D. 65.31 mm

92. A mating hole measures 1557.06 mm and its shaft measures 1556.98 mm. What diametral clearance exists?

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

93. Inspection accepts 8145 of 8165 manufactured parts. What is the observed percent yield?

- A. 49.88 %
- B. 149.63 %
- C. 99.76 %
- D. 100.25 %

94. A machining operation reduces a diameter from 1566 mm to 1562 mm. What percent reduction in diameter occurs?

- A. 0.53 %
- B. 0.26 %
- C. 0.38 %
- D. 0.51 %

95. Four repeated measurements are 65.37, 65.33, 65.36, and 65.34 mm. What is their arithmetic mean?

- A. 65.35 mm

- B. 32.67 mm
- C. 261.4 mm
- D. 65.37 mm

96. A mating hole measures 1561.04 mm and its shaft measures 1560.98 mm. What diametral clearance exists?

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

97. Inspection accepts 8165 of 8185 manufactured parts. What is the observed percent yield?

- A. 49.88 %
- B. 99.76 %
- C. 149.63 %
- D. 100.24 %

98. A machining operation reduces a diameter from 1570 mm to 1566 mm. What percent reduction in diameter occurs?

- A. 0.25 %
- B. 0.26 %
- C. 0.38 %
- D. 0.51 %

99. Four repeated measurements are 65.41, 65.37, 65.40, and 65.38 mm. What is their arithmetic mean?

- A. 32.7 mm
- B. 261.56 mm

- C. 65.41 mm
- D. 65.39 mm

100. A mating hole measures 1565.05 mm and its shaft measures 1564.98 mm. What diametral clearance exists?

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

Practice Exam 10: 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 19634.2 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 7668581.43 \$/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 63027.46 \$/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 3.92 . 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 19685 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. 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 6742843.75 \$/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 63187.46 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

8. 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 3.92 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

9. B — B — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 19735.8 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. 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 9034345 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

11. 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 63347.47 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

12. 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 3.92 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

13. B — B — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 19786.6 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. 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 7781432.86 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

15. C — C — 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 63507.47 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

16. 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 3.92 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

17. A — A — Using $\sigma = \frac{M c}{I}$ for a rectangle reduces to $6M$ divided by $b h^2$. The moment must be expressed in newton-millimeters. Substitution gives 0.14 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 $\Delta L = \frac{PL}{AE}$. Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 60.71 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. 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 2.5 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign

20. B — B — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $P = \frac{\pi^2 EI}{L^2}$. Substitution gives 193.87 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

21. 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 3051.94 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. 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

23. 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 387.55 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 1023.35 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 0.14 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

26. C — C — Elastic axial elongation follows PL divided by AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 61.03 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. 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

28. D — D — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\pi^2 EI$ divided by L^2 . Substitution gives 192.93 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

29. 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 3067.43 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. 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 1.17. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

31. 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 387.61 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

32. 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 1295.65 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

33. A — A — 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 0.14 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 61.35 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 2.5. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign

36. B — B — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\frac{\pi^2 EI}{L^2}$. Substitution gives 191.99 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

37. 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 3082.92 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. 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 1.17. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

39. 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 387.67 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 926.86 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

41. C — C — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 4868.75 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

42. D — D — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 49.87 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. 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 3865.72 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. A — A — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 15630 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. B — B — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 4594.12 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. A — A — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 43.64 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. D — D — 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 6890.08 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 14245.45 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. A — A — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 4350 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. B — B — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 58.19 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. D — D — 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 5075.09 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. C — C — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 13091.67 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

53. A — A — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 4906.25 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

54. C — C — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 5879.31 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. 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 3062.12 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 6589.38 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship

57. C — C — Collar friction torque equals friction coefficient times axial load times mean friction radius; kilonewtons are converted to newtons. Substitution gives 1239.2 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

58. 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 950.04 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 5985 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 3062.4 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 6560.48 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship
- 62. B — B —** Collar friction torque equals friction coefficient times axial load times mean friction radius; kilonewtons are converted to newtons. Substitution gives 1538.46 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 1144.64 kN. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the
- 64. D — D —** For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 5716.67 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. 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 3062.68 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 6528 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 —** 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 1006.2 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before
- 68. 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,

69. 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 57.5 A. 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 — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 52523.31 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

71. 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 68596 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

72. A — A — 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

73. A — A — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 47.97 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

74. 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 971.88 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

75. 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,

76. 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 46.2 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

77. C — C — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 48911.54 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

78. 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 65772 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

79. 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 3.59 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

80. D — D — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 47.98 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

81. 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 937.2 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

82. 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,

83. 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 66.29 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

84. A — A — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 45817.48 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

85. 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 62920 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

86. 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 3.59 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

87. C — C — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 47.99 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

88. 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 1059.08 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

89. 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,

90. B — B — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.26 %. 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. 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 65.31 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

92. A — A — 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,

93. 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 99.76 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

94. B — B — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.26 %. 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. 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 65.35 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

96. D — D — 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,

97. 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 99.76 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

98. A — A — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.25 %. 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. 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 65.39 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

100. 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,