

PRACTICE EXAM 8: 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 603.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 15316.2 mm
- B. 7658.1 mm
- C. 22974.3 mm
- D. 15341.6 mm

2. A machine saves 13710 labor-hours annually at \$2467/h. Ignoring interest, its \$131100 residual value is credited evenly over a 6-year evaluation. What is the annual net benefit?

- A. 2807622.5 \$/year
- B. 5615245 \$/year
- C. 5658945 \$/year
- D. 11230490 \$/year

3. A proposed fixture has a fixed fabrication cost of \$49180 and a variable cost of \$608000 spread over 2464 units. What is the average cost per unit?

- A. 24713.38 \$/unit
- B. 54369.43 \$/unit
- C. 98853.51 \$/unit
- D. 49426.75 \$/unit

4. A component is expected to experience 1233 MPa maximum stress, while its allowable design stress is 316.25 MPa. What design factor is implied?

- A. 1.95
- B. 4.4
- C. 3.9
- D. 7.8

5. A drawing dimension is 605.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 7683.5 mm
- B. 15367 mm
- C. 23050.5 mm
- D. 15392.4 mm

6. A machine saves 13750 labor-hours annually at \$2475/h. Ignoring interest, its \$131500 residual value is credited evenly over a 7-year evaluation. What is the annual net benefit?

- A. 4842821.43 \$/year
- B. 2421410.71 \$/year
- C. 4880392.86 \$/year
- D. 9685642.86 \$/year

7. A proposed fixture has a fixed fabrication cost of \$49340 and a variable cost of \$610000 spread over 2472 units. What is the average cost per unit?

- A. 24793.38 \$/unit
- B. 54545.44 \$/unit
- C. 49586.76 \$/unit
- D. 99173.53 \$/unit

8. A component is expected to experience 1237 MPa maximum stress, while its allowable design stress is 317.25 MPa. What design factor is implied?

- A. 1.95
- B. 4.4
- C. 7.8
- D. 3.9

9. A drawing dimension is 607.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 15417.8 mm
- B. 7708.9 mm
- C. 23126.7 mm
- D. 15443.2 mm

10. A machine saves 13790 labor-hours annually at \$2483/h. Ignoring interest, its \$131900 residual value is credited evenly over a 8-year evaluation. What is the annual net benefit?

- A. 2131791.88 \$/year
- B. 4296558.75 \$/year
- C. 4263583.75 \$/year
- D. 8527167.5 \$/year

11. A proposed fixture has a fixed fabrication cost of \$49500 and a variable cost of \$612000 spread over 2480 units. What is the average cost per unit?

- A. 24873.39 \$/unit
- B. 54721.45 \$/unit
- C. 99493.55 \$/unit
- D. 49746.77 \$/unit

12. A component is expected to experience 1241 MPa maximum stress, while its allowable design stress is 318.25 MPa. What design factor is implied?

- A. 1.95
- B. 3.9
- C. 4.4
- D. 7.8

13. A drawing dimension is 609.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 7734.3 mm
- B. 15468.6 mm
- C. 23202.9 mm
- D. 15494 mm

14. A machine saves 13830 labor-hours annually at \$2491/h. Ignoring interest, its \$132300 residual value is credited evenly over a 6-year evaluation. What is the annual net benefit?

- A. 2859852.5 \$/year
- B. 5763805 \$/year
- C. 11439410 \$/year
- D. 5719705 \$/year

15. A proposed fixture has a fixed fabrication cost of \$49660 and a variable cost of \$614000 spread over 2488 units. What is the average cost per unit?

- A. 49906.78 \$/unit
- B. 24953.39 \$/unit
- C. 54897.46 \$/unit
- D. 99813.57 \$/unit

16. A component is expected to experience 1245 MPa maximum stress, while its allowable design stress is 319.25 MPa. What design factor is implied?

- A. 1.95
- B. 4.4
- C. 3.9
- D. 7.8

17. At a point, $\sigma_x = 2460$ MPa, $\sigma_y = 1220$ MPa, and $\tau_{xy} = 620.0$ MPa. What is the von Mises equivalent stress for plane stress?

- A. 2745.91 MPa
- B. 2385.79 MPa
- C. 1240 MPa
- D. 1192.9 MPa

18. A part has alternating stress 2492 MPa and mean stress 1261 MPa. With $S_e = 3773$ MPa and $S_{ut} = 6455$ MPa, what Goodman fatigue factor of safety applies?

- A. 1.51
- B. 5.12
- C. 1.17
- D. 1.39

19. A prismatic bar carries 2424 kN axial tension over a net area of 6310 mm². What is the average normal stress?

- A. 192.08 MPa
- B. 192.49 MPa
- C. 576.23 MPa

D. 384.15 MPa

20. A solid circular shaft of diameter 56 mm transmits 24760 N·m torque. What is its maximum torsional shear stress?

A. 718.05 MPa

B. 359.03 MPa

C. 1436.11 MPa

D. 1436.66 MPa

21. A rectangular beam 2468 mm wide and 2528 mm deep carries a maximum bending moment of 609.0 kN·m. What is the extreme-fiber bending stress?

A. 0.12 MPa

B. 0.23 MPa

C. 0.53 MPa

D. 0.67 MPa

22. A steel tie, length 25100 mm and area 6475 mm², carries 2440 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

A. 23.65 mm

B. 94.59 mm

C. 47.29 mm

D. 24.2 mm

23. A ductile member has yield strength 6230 MPa and calculated von Mises stress 2487 MPa. What factor of safety against yielding results?

A. 2.51

B. 1.25

- C. 1.51
- D. 3.51

24. A pin-ended column has $E = 200,000 \text{ MPa}$, $I = 127700000 \text{ mm}^4$, and length 32125 mm . What is its Euler critical load?

- A. 977 kN
- B. 61.06 kN
- C. 77.75 kN
- D. 244.25 kN

25. At a point, $\sigma_x = 2476 \text{ MPa}$, $\sigma_y = 1228 \text{ MPa}$, and $\tau_{xy} = 624.0 \text{ MPa}$. What is the von Mises equivalent stress for plane stress?

- A. 2763.79 MPa
- B. 1248 MPa
- C. 2401.28 MPa
- D. 1200.64 MPa

26. A part has alternating stress 2508 MPa and mean stress 1269 MPa . With $S_e = 3797 \text{ MPa}$ and $S_{ut} = 6495 \text{ MPa}$, what Goodman fatigue factor of safety applies?

- A. 1.51
- B. 5.12
- C. 1.39
- D. 1.17

27. A prismatic bar carries 2440 kN axial tension over a net area of 6350 mm^2 . What is the average normal stress?

- A. 384.25 MPa

- B. 192.13 MPa
- C. 192.54 MPa
- D. 576.38 MPa

28. A solid circular shaft of diameter 52 mm transmits 24920 N·m torque. What is its maximum torsional shear stress?

- A. 451.31 MPa
- B. 902.63 MPa
- C. 1805.25 MPa
- D. 1805.8 MPa

29. A rectangular beam 2484 mm wide and 2544 mm deep carries a maximum bending moment of 613.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.11 MPa
- B. 0.23 MPa
- C. 0.52 MPa
- D. 0.66 MPa

30. A steel tie, length 25260 mm and area 6515 mm², carries 2456 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 47.61 mm
- B. 23.81 mm
- C. 95.22 mm
- D. 24.36 mm

31. A ductile member has yield strength 6270 MPa and calculated von Mises stress 2503 MPa. What factor of safety against yielding results?

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

32. A pin-ended column has $E = 200,000 \text{ MPa}$, $I = 128500000 \text{ mm}^4$, and length 32325 mm . What is its Euler critical load?

- A. 970.99 kN
- B. 60.69 kN
- C. 77.27 kN
- D. 242.75 kN

33. At a point, $\sigma_x = 2492 \text{ MPa}$, $\sigma_y = 1236 \text{ MPa}$, and $\tau_{xy} = 628.0 \text{ MPa}$. What is the von Mises equivalent stress for plane stress?

- A. 2781.68 MPa
- B. 2416.77 MPa
- C. 1256 MPa
- D. 1208.39 MPa

34. A part has alternating stress 2524 MPa and mean stress 1277 MPa . With $S_e = 3821 \text{ MPa}$ and $S_{ut} = 6535 \text{ MPa}$, what Goodman fatigue factor of safety applies?

- A. 1.17
- B. 1.51
- C. 5.12
- D. 1.39

35. A prismatic bar carries 2456 kN axial tension over a net area of 6390 mm^2 . What is the average normal stress?

- A. 192.18 MPa
- B. 192.59 MPa
- C. 384.35 MPa
- D. 576.53 MPa

36. A solid circular shaft of diameter 58 mm transmits 25080 N·m torque. What is its maximum torsional shear stress?

- A. 327.33 MPa
- B. 654.66 MPa
- C. 1309.31 MPa
- D. 1309.86 MPa

37. A rectangular beam 2500 mm wide and 2560 mm deep carries a maximum bending moment of 617.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.11 MPa
- B. 0.52 MPa
- C. 0.66 MPa
- D. 0.23 MPa

38. A steel tie, length 25420 mm and area 6555 mm², carries 2472 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 47.93 mm
- B. 23.97 mm
- C. 95.86 mm
- D. 24.52 mm

39. A ductile member has yield strength 6310 MPa and calculated von Mises stress 2519 MPa. What factor of safety against yielding results?

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

40. A pin-ended column has $E = 200,000$ MPa, $I = 129300000$ mm⁴, and length 32525 mm. What is its Euler critical load?

- A. 965.06 kN
- B. 60.32 kN
- C. 241.26 kN
- D. 76.8 kN

41. Using the relation $T = KFd$, estimate bolt preload when installation torque is 12180 N·m, nut factor $K = 0.2$, and nominal diameter is 18 mm.

- A. 3383.6 kN
- B. 5075 kN
- C. 3383.33 kN
- D. 676.67 kN

42. Two parallel fillet welds, each 2462 mm long with 6 mm leg size, carry 1211 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 81.98 MPa
- B. 40.99 MPa
- C. 115.95 MPa
- D. 57.98 MPa

43. A lap joint uses 4 identical 14-mm-diameter rivets in single shear to carry 2429 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 3944.77 MPa
- B. 15779.08 MPa
- C. 1972.38 MPa
- D. 7889.54 MPa

44. A bolt transfers 2446 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. 3244.11 MPa
- B. 10191.67 MPa
- C. 5095.83 MPa
- D. 20383.33 MPa

45. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 12220 N·m, nut factor $K = 0.2$, and nominal diameter is 16 mm.

- A. 3819.02 kN
- B. 5728.12 kN
- C. 763.75 kN
- D. 3818.75 kN

46. Two parallel fillet welds, each 2470 mm long with 7 mm leg size, carry 1215 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 70.27 MPa
- B. 49.7 MPa
- C. 35.14 MPa
- D. 99.39 MPa

47. A lap joint uses 4 identical 16-mm-diameter rivets in single shear to carry 2437 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 3030.16 MPa
- B. 12120.64 MPa
- C. 1515.08 MPa
- D. 6060.32 MPa

48. A bolt transfers 2454 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. 3905.66 MPa
- B. 6135 MPa
- C. 12270 MPa
- D. 24540 MPa

49. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 12260 N·m, nut factor $K = 0.2$, and nominal diameter is 17 mm.

- A. 3606.15 kN
- B. 5408.82 kN
- C. 721.18 kN
- D. 3605.88 kN

50. Two parallel fillet welds, each 2478 mm long with 8 mm leg size, carry 1219 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 61.49 MPa
- B. 43.49 MPa
- C. 30.75 MPa
- D. 86.97 MPa

51. A lap joint uses 4 identical 12-mm-diameter rivets in single shear to carry 2445 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 5404.64 MPa
- B. 21618.55 MPa
- C. 2702.32 MPa
- D. 10809.27 MPa

52. A bolt transfers 2462 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. 3562.18 MPa
- B. 5595.45 MPa
- C. 22381.82 MPa
- D. 11190.91 MPa

53. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 12300 N·m, nut factor $K = 0.2$, and nominal diameter is 18 mm.

- A. 3416.94 kN
- B. 5125 kN
- C. 3416.67 kN
- D. 683.33 kN

54. A 20-tooth pinion rotating at 13650 rpm drives a 58-tooth gear. Neglecting slip, what is the gear speed?

- A. 4706.9 rpm
- B. 2353.45 rpm
- C. 8943.1 rpm
- D. 13650 rpm

55. A shaft transmits 1206 hp at 25020 rpm. Using $T(\text{in} \cdot \text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1518.95 in·lbf
- B. 3037.9 in·lbf
- C. 4556.84 in·lbf
- D. 6075.79 in·lbf

56. An open belt connects a 125-mm driver at 12820 rpm to a 310-mm driven pulley. Neglecting slip, what is driven speed?

- A. 2584.68 rpm
- B. 7650.65 rpm
- C. 5169.35 rpm
- D. 12820 rpm

57. A collar bearing supports 604.5 kN at mean friction radius 0.022 m with friction coefficient 0.090. What friction torque must be overcome?

- A. 2393.82 N·m
- B. 1795.36 N·m
- C. 2394.37 N·m
- D. 1196.91 N·m

58. A power screw has lead 6 mm, input torque 2433 N·m, and raising efficiency 0.34. What axial load can it raise?

- A. 433.13 kN
- B. 1299.39 kN
- C. 866.26 kN
- D. 1732.53 kN

59. A 21-tooth pinion rotating at 13700 rpm drives a 60-tooth gear. Neglecting slip, what is the gear speed?

- A. 4795 rpm
- B. 2397.5 rpm
- C. 8905 rpm
- D. 13700 rpm

60. A shaft transmits 1211 hp at 25120 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1519.17 in·lbf
- B. 3038.35 in·lbf
- C. 4557.52 in·lbf
- D. 6076.69 in·lbf

61. An open belt connects a 120-mm driver at 12870 rpm to a 300-mm driven pulley. Neglecting slip, what is driven speed?

- A. 2574 rpm
- B. 7722 rpm
- C. 5148 rpm
- D. 12870 rpm

62. A collar bearing supports 607.0 kN at mean friction radius 0.021 m with friction coefficient 0.085. What friction torque must be overcome?

- A. 1083.5 N·m
- B. 2166.99 N·m
- C. 1625.24 N·m
- D. 2167.54 N·m

63. A power screw has lead 8 mm, input torque 2443 N·m, and raising efficiency 0.35. What axial load can it raise?

- A. 335.78 kN
- B. 1007.33 kN
- C. 1343.11 kN
- D. 671.55 kN

64. A 18-tooth pinion rotating at 13750 rpm drives a 54-tooth gear. Neglecting slip, what is the gear speed?

- A. 2291.67 rpm
- B. 4583.33 rpm
- C. 9166.67 rpm
- D. 13750 rpm

65. A shaft transmits 1216 hp at 25220 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1519.4 in·lbf
- B. 3038.79 in·lbf
- C. 4558.19 in·lbf
- D. 6077.59 in·lbf

66. An open belt connects a 130-mm driver at 12920 rpm to a 320-mm driven pulley. Neglecting slip, what is driven speed?

- A. 5248.75 rpm
- B. 2624.38 rpm
- C. 7671.25 rpm
- D. 12920 rpm

67. A thin-walled cylindrical vessel has internal pressure 122.0 MPa, inside diameter 6350 mm, and wall thickness 14 mm. What is the membrane hoop stress?

- A. 13833.93 MPa
- B. 55335.71 MPa
- C. 27667.86 MPa
- D. 13834.48 MPa

68. A linear spring has stiffness 1216 kN/m and is compressed 46 mm. What force does it exert?

- A. 27968 N
- B. 83904 N
- C. 27968.55 N
- D. 55936 N

69. An undamped single-degree system has mass 1210 kg and stiffness 620000 N/m. What is its natural frequency in hertz?

- A. 1.8 Hz
- B. 5.4 Hz
- C. 3.6 Hz
- D. 7.21 Hz

70. A hydraulic cylinder must produce 608.5 kN using a piston area of 12830 mm². Neglecting losses, what gauge pressure is required?

- A. 47.43 MPa
- B. 23.71 MPa
- C. 24.12 MPa
- D. 94.86 MPa

71. A simply supported beam of span 2.6 m carries a central point load of 1212 kN. What is the maximum bending moment?

- A. 1575.6 kN·m
- B. 787.8 kN·m
- C. 393.9 kN·m
- D. 466.15 kN·m

72. A lever has an effort arm of 3705 mm and a load arm of 2430 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 2.29
- C. 3.05
- D. 1.52

73. A 364-V DC source is applied across a 7- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 26 A
- B. 78 A
- C. 52 A
- D. 104 A

74. A thin-walled cylindrical vessel has internal pressure 122.7 MPa, inside diameter 6385 mm, and wall thickness 12 mm. What is the membrane hoop stress?

- A. 16321.66 MPa
- B. 65286.62 MPa
- C. 16322.21 MPa
- D. 32643.31 MPa

75. A linear spring has stiffness 1223 kN/m and is compressed 44 mm. What force does it exert?

- A. 53812 N
- B. 26906 N
- C. 80718 N
- D. 26906.55 N

76. An undamped single-degree system has mass 1217 kg and stiffness 623500 N/m. What is its natural frequency in hertz?

- A. 1.8 Hz
- B. 3.6 Hz
- C. 5.4 Hz
- D. 7.2 Hz

77. A hydraulic cylinder must produce 612.0 kN using a piston area of 12900 mm². Neglecting losses, what gauge pressure is required?

- A. 23.72 MPa
- B. 47.44 MPa
- C. 24.13 MPa
- D. 94.88 MPa

78. A simply supported beam of span 2.5 m carries a central point load of 1219 kN. What is the maximum bending moment?

- A. 1523.75 kN·m
- B. 380.94 kN·m
- C. 487.6 kN·m
- D. 761.88 kN·m

79. A lever has an effort arm of 3726 mm and a load arm of 2444 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 2.29
- C. 1.52
- D. 3.05

80. A 366-V DC source is applied across a 9- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 40.67 A
- B. 20.33 A
- C. 61 A
- D. 81.33 A

81. A thin-walled cylindrical vessel has internal pressure 123.4 MPa, inside diameter 6420 mm, and wall thickness 13 mm. What is the membrane hoop stress?

- A. 15235.15 MPa
- B. 60940.62 MPa
- C. 15235.7 MPa
- D. 30470.31 MPa

82. A linear spring has stiffness 1230 kN/m and is compressed 42 mm. What force does it exert?

- A. 25830 N
- B. 77490 N
- C. 51660 N
- D. 25830.55 N

83. An undamped single-degree system has mass 1224 kg and stiffness 627000 N/m. What is its natural frequency in hertz?

- A. 1.8 Hz
- B. 3.6 Hz
- C. 5.4 Hz
- D. 7.2 Hz

84. A hydraulic cylinder must produce 615.5 kN using a piston area of 12970 mm². Neglecting losses, what gauge pressure is required?

- A. 47.46 MPa
- B. 23.73 MPa
- C. 24.14 MPa
- D. 94.91 MPa

85. A simply supported beam of span 2.4 m carries a central point load of 1226 kN. What is the maximum bending moment?

- A. 1471.2 kN·m
- B. 735.6 kN·m
- C. 367.8 kN·m
- D. 510.83 kN·m

86. A lever has an effort arm of 3747 mm and a load arm of 2458 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 2.29
- C. 3.05
- D. 1.52

87. A 368-V DC source is applied across a 6-Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 30.67 A
- B. 92 A
- C. 61.33 A
- D. 122.67 A

88. A thin-walled cylindrical vessel has internal pressure 124.1 MPa, inside diameter 6455 mm, and wall thickness 14 mm. What is the membrane hoop stress?

- A. 28609.48 MPa
- B. 14304.74 MPa
- C. 57218.96 MPa
- D. 14305.29 MPa

89. A linear spring has stiffness 1237 kN/m and is compressed 40 mm. What force does it exert?

- A. 24740 N
- B. 49480 N
- C. 74220 N
- D. 24740.55 N

90. A machining operation reduces a diameter from 1222 mm to 1218 mm. What percent reduction in diameter occurs?

- A. 0.6 %
- B. 0.49 %
- C. 0.65 %
- D. 0.33 %

91. Four repeated measurements are 61.93, 61.89, 61.92, and 61.90 mm. What is their arithmetic mean?

- A. 61.91 mm

- B. 30.96 mm
- C. 247.64 mm
- D. 61.93 mm

92. A mating hole measures 1217.05 mm and its shaft measures 1216.98 mm. What diametral clearance exists?

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

93. Inspection accepts 6445 of 6465 manufactured parts. What is the observed percent yield?

- A. 49.85 %
- B. 149.54 %
- C. 99.69 %
- D. 100.31 %

94. A machining operation reduces a diameter from 1226 mm to 1222 mm. What percent reduction in diameter occurs?

- A. 0.6 %
- B. 0.33 %
- C. 0.49 %
- D. 0.65 %

95. Four repeated measurements are 61.97, 61.93, 61.96, and 61.94 mm. What is their arithmetic mean?

- A. 61.95 mm
- B. 30.98 mm

- C. 247.8 mm
- D. 61.97 mm

96. A mating hole measures 1221.06 mm and its shaft measures 1220.98 mm. What diametral clearance exists?

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

97. Inspection accepts 6465 of 6485 manufactured parts. What is the observed percent yield?

- A. 49.85 %
- B. 99.69 %
- C. 149.54 %
- D. 100.31 %

98. A machining operation reduces a diameter from 1230 mm to 1226 mm. What percent reduction in diameter occurs?

- A. 0.6 %
- B. 0.49 %
- C. 0.65 %
- D. 0.33 %

99. Four repeated measurements are 62.01, 61.97, 62.00, and 61.98 mm. What is their arithmetic mean?

- A. 61.99 mm
- B. 31 mm
- C. 247.96 mm

D. 62.01 mm

100. A mating hole measures 1225.04 mm and its shaft measures 1224.98 mm. What diametral clearance exists?

A. 0.04 mm

B. 0.02 mm

C. 0.06 mm

D. 0.03 mm

Practice Exam 8: Answer Key and Explanations

1. A — A — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 15316.2 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 5615245 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

3. 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 49426.75 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

4. 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 3.9 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

5. B — B — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 15367 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. 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 4842821.43

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

7. 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 49586.76 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

8. D — D — The design factor is the ratio of the expected maximum stress to the allowable design stress, not the inverse or a difference. Substitution gives 3.9 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

9. A — A — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 15417.8 mm. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically tidy but physically inconsistent

10. C — C — Annual labor savings are first converted to dollars, the stated residual credit is subtracted, and the remaining benefit is distributed evenly across the evaluation life. Substitution gives 4263583.75 \$/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 49746.77 \$/unit. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

12. B — B — The design factor is the ratio of the expected maximum stress to the allowable design stress, not the inverse or a difference. Substitution gives 3.9 . 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 15468.6 mm. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically tidy but physically inconsistent

14. D — D — Annual labor savings are first converted to dollars, the stated residual credit is subtracted, and the remaining benefit is distributed evenly across the evaluation life. Substitution gives 5719705 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

15. 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 49906.78 \$/unit. Keeping the

calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents

16. C — C — The design factor is the ratio of the expected maximum stress to the allowable design stress, not the inverse or a difference. Substitution gives 3.9 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

17. 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 2385.79 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,

18. 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

19. 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 384.15 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

20. 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 718.05 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

21. 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 0.23 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

22. C — C — Elastic axial elongation follows PL/AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 47.29 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,

23. 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 2.51 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path, sign

24. D — D — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\pi^2 EI/L^2$. Substitution gives 244.25 kN. Keeping the calculation consistent

with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

25. C — C — Plane-stress von Mises stress combines both normal stresses and shear through the distortion-energy expression, including three times shear stress squared. Substitution gives 2401.28 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,

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

27. 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 384.25 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

28. 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 902.63 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

29. 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 0.23 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

30. A — A — Elastic axial elongation follows PL/AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 47.61 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,

31. 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

32. D — D — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\pi^2 EI/L^2$. Substitution gives 242.75 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

33. 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 2416.77

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,

34. A — A — 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

35. C — C — Average axial stress is force divided by net resisting area. Converting kilonewtons to newtons makes newtons per square millimeter, numerically equal to megapascals. Substitution gives 384.35 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

36. 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 654.66 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

37. D — D — Using σ equals $M c$ over I for a rectangle reduces to $6M$ divided by $b h$ squared. The moment must be expressed in newton-millimeters. Substitution gives 0.23 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

38. A — A — Elastic axial elongation follows PL divided by AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 47.93 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,

39. D — D — 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

40. 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 241.26 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

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 3383.33 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 57.98 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. A — A — Equal load sharing divides the applied force among the rivets, and single-shear area is the circular cross-sectional area of one rivet. Substitution gives 3944.77 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting

44. B — B — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 10191.67 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

45. D — D — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 3818.75 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

46. B — B — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 49.7 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified in

47. A — A — Equal load sharing divides the applied force among the rivets, and single-shear area is the circular cross-sectional area of one rivet. Substitution gives 3030.16 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 12270 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. D — D — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 3605.88 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 43.49 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified in

51. A — A — Equal load sharing divides the applied force among the rivets, and single-shear area is the circular cross-sectional area of one rivet. Substitution gives 5404.64 MPa. Keeping the calculation

consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting

52. D — D — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 11190.91 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. C — C — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 3416.67 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

54. A — A — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 4706.9 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 3037.9 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. 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 5169.35 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 1196.91 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 866.26 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 4795 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 3038.35 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 5148 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship

62. A — A — Collar friction torque equals friction coefficient times axial load times mean friction radius; kilonewtons are converted to newtons. Substitution gives 1083.5 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. D — D — 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 671.55 kN. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the

64. B — B — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 4583.33 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 3038.79 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 5248.75 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 — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 27667.86 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature rounding can

68. 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 55936 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

69. 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 3.6 Hz. Keeping the

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

70. A — A — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 47.43 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

71. B — B — For a simply supported beam with a centered point load, reactions are equal and the maximum moment at midspan is PL divided by four. Substitution gives 787.8 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

72. 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,

73. 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 52 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

74. D — D — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 32643.31 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

75. 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 53812 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

76. B — B — 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 3.6 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

77. B — B — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 47.44 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

78. 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 761.88 kN·m. Keeping the

calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

79. 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,

80. 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 40.67 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

81. D — D — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 30470.31 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

82. C — C — Hooke's law gives spring force as stiffness times deflection. Converting kilonewtons per meter to newtons per meter makes the result newtons. Substitution gives 51660 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

83. B — B — 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 3.6 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

84. A — A — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 47.46 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 shift a close design

85. B — B — For a simply supported beam with a centered point load, reactions are equal and the maximum moment at midspan is PL divided by four. Substitution gives 735.6 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

86. 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,

87. 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 61.33 A.

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

88. A — A — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 28609.48 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

89. 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 49480 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

90. D — D — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.33 %. 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. 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 61.91 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

92. C — C — Diametral clearance is the actual hole diameter minus the actual shaft diameter. Radius differences would give only half the requested diametral value. Substitution gives 0.07 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 99.69 %. 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 0.33 %. 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 61.95 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 0.08 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 99.69 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

98. D — D — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.33 %. 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. 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 61.99 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 0.06 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,