

PRACTICE EXAM 16: 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 1283.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 16294.1 mm
- B. 48882.3 mm
- C. 32588.2 mm
- D. 32613.6 mm

2. A machine saves 27310 labor-hours annually at \$5187/h. Ignoring interest, its \$267100 residual value is credited evenly over a 7-year evaluation. What is the annual net benefit?

- A. 20198552.86 \$/year
- B. 10099276.43 \$/year
- C. 20274867.14 \$/year
- D. 40397105.71 \$/year

3. A proposed fixture has a fixed fabrication cost of \$103580 and a variable cost of \$1288000 spread over 5184 units. What is the average cost per unit?

- A. 51914.23 \$/unit
- B. 103828.46 \$/unit
- C. 114211.3 \$/unit
- D. 207656.91 \$/unit

4. A component is expected to experience 2593 MPa maximum stress, while its allowable design stress is 656.25 MPa. What design factor is implied?

- A. 1.98
- B. 4.45
- C. 7.9
- D. 3.95

5. A drawing dimension is 1285.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 16319.5 mm
- B. 48958.5 mm
- C. 32664.4 mm
- D. 32639 mm

6. A machine saves 27350 labor-hours annually at \$5195/h. Ignoring interest, its \$267500 residual value is credited evenly over a 8-year evaluation. What is the annual net benefit?

- A. 17726968.75 \$/year
- B. 8863484.38 \$/year
- C. 17793843.75 \$/year
- D. 35453937.5 \$/year

7. A proposed fixture has a fixed fabrication cost of \$103740 and a variable cost of \$1290000 spread over 5192 units. What is the average cost per unit?

- A. 51994.23 \$/unit
- B. 103988.46 \$/unit
- C. 114387.31 \$/unit
- D. 207976.92 \$/unit

8. A component is expected to experience 2597 MPa maximum stress, while its allowable design stress is 657.25 MPa. What design factor is implied?

- A. 1.98
- B. 4.45
- C. 3.95
- D. 7.9

9. A drawing dimension is 1287.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 16344.9 mm
- B. 32689.8 mm
- C. 49034.7 mm
- D. 32715.2 mm

10. A machine saves 27390 labor-hours annually at \$5203/h. Ignoring interest, its \$267900 residual value is credited evenly over a 6-year evaluation. What is the annual net benefit?

- A. 11853522.5 \$/year
- B. 23796345 \$/year
- C. 47414090 \$/year
- D. 23707045 \$/year

11. A proposed fixture has a fixed fabrication cost of \$103900 and a variable cost of \$1292000 spread over 5200 units. What is the average cost per unit?

- A. 104148.46 \$/unit
- B. 52074.23 \$/unit
- C. 114563.31 \$/unit
- D. 208296.92 \$/unit

12. A component is expected to experience 2601 MPa maximum stress, while its allowable design stress is 658.25 MPa. What design factor is implied?

- A. 1.98
- B. 4.45
- C. 3.95
- D. 7.9

13. A drawing dimension is 1289.0 in. Convert this length to millimeters using 1 in = 25.4 mm.

- A. 16370.3 mm
- B. 32740.6 mm
- C. 49110.9 mm
- D. 32766 mm

14. A machine saves 27430 labor-hours annually at \$5211/h. Ignoring interest, its \$268300 residual value is credited evenly over a 7-year evaluation. What is the annual net benefit?

- A. 20381347.14 \$/year
- B. 10190673.57 \$/year
- C. 20458004.29 \$/year
- D. 40762694.29 \$/year

15. A proposed fixture has a fixed fabrication cost of \$104060 and a variable cost of \$1294000 spread over 5208 units. What is the average cost per unit?

- A. 52154.23 \$/unit
- B. 114739.31 \$/unit
- C. 104308.46 \$/unit
- D. 208616.93 \$/unit

16. A component is expected to experience 2605 MPa maximum stress, while its allowable design stress is 659.25 MPa. What design factor is implied?

- A. 1.98
- B. 4.45
- C. 7.9
- D. 3.95

17. At a point, $\sigma_x = 5180$ MPa, $\sigma_y = 2580$ MPa, and $\tau_{xy} = 1300.0$ MPa. What is the von Mises equivalent stress for plane stress?

- A. 5019.4 MPa
- B. 5786.95 MPa
- C. 2600 MPa
- D. 2509.7 MPa

18. A part has alternating stress 5212 MPa and mean stress 2621 MPa. With $S_e = 7853$ MPa and $S_{ut} = 13255$ MPa, what Goodman fatigue factor of safety applies?

- A. 1.51
- B. 5.06
- C. 1.38
- D. 1.16

19. A prismatic bar carries 5144 kN axial tension over a net area of 13110 mm². What is the average normal stress?

- A. 196.19 MPa
- B. 196.6 MPa
- C. 392.37 MPa

D. 588.56 MPa

20. A solid circular shaft of diameter 56 mm transmits 51960 N·m torque. What is its maximum torsional shear stress?

A. 753.43 MPa

B. 1506.87 MPa

C. 3013.74 MPa

D. 3014.29 MPa

21. A rectangular beam 5188 mm wide and 5248 mm deep carries a maximum bending moment of 1289.0 kN·m. What is the extreme-fiber bending stress?

A. 0.03 MPa

B. 0.44 MPa

C. 0.58 MPa

D. 0.05 MPa

22. A steel tie, length 52300 mm and area 13275 mm², carries 5160 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

A. 101.65 mm

B. 50.82 mm

C. 203.29 mm

D. 51.37 mm

23. A ductile member has yield strength 13030 MPa and calculated von Mises stress 5207 MPa. What factor of safety against yielding results?

A. 1.25

B. 1.5

- C. 2.5
- D. 3.5

24. A pin-ended column has $E = 200,000 \text{ MPa}$, $I = 263700000 \text{ mm}^4$, and length 66125 mm . What is its Euler critical load?

- A. 476.18 kN
- B. 119.04 kN
- C. 29.76 kN
- D. 37.89 kN

25. At a point, $\sigma_x = 5196 \text{ MPa}$, $\sigma_y = 2588 \text{ MPa}$, and $\tau_{xy} = 1304.0 \text{ MPa}$. What is the von Mises equivalent stress for plane stress?

- A. 5804.84 MPa
- B. 5034.89 MPa
- C. 2608 MPa
- D. 2517.45 MPa

26. A part has alternating stress 5228 MPa and mean stress 2629 MPa . With $S_e = 7877 \text{ MPa}$ and $S_{ut} = 13295 \text{ MPa}$, what Goodman fatigue factor of safety applies?

- A. 1.51
- B. 5.06
- C. 1.38
- D. 1.16

27. A prismatic bar carries 5160 kN axial tension over a net area of 13150 mm^2 . What is the average normal stress?

- A. 196.2 MPa

- B. 196.61 MPa
- C. 392.4 MPa
- D. 588.59 MPa

28. A solid circular shaft of diameter 52 mm transmits 52120 N·m torque. What is its maximum torsional shear stress?

- A. 1887.84 MPa
- B. 943.92 MPa
- C. 3775.67 MPa
- D. 3776.22 MPa

29. A rectangular beam 5204 mm wide and 5264 mm deep carries a maximum bending moment of 1293.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.03 MPa
- B. 0.44 MPa
- C. 0.58 MPa
- D. 0.05 MPa

30. A steel tie, length 52460 mm and area 13315 mm², carries 5176 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 50.98 mm
- B. 101.97 mm
- C. 203.93 mm
- D. 51.53 mm

31. A ductile member has yield strength 13070 MPa and calculated von Mises stress 5223 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 $E = 200,000 \text{ MPa}$, $I = 264500000 \text{ mm}^4$, and length 66325 mm . What is its Euler critical load?

- A. 118.69 kN
- B. 474.75 kN
- C. 29.67 kN
- D. 37.78 kN

33. At a point, $\sigma_x = 5212 \text{ MPa}$, $\sigma_y = 2596 \text{ MPa}$, and $\tau_{xy} = 1308.0 \text{ MPa}$. What is the von Mises equivalent stress for plane stress?

- A. 5822.73 MPa
- B. 2616 MPa
- C. 5050.39 MPa
- D. 2525.19 MPa

34. A part has alternating stress 5244 MPa and mean stress 2637 MPa . With $S_e = 7901 \text{ MPa}$ and $S_{ut} = 13335 \text{ MPa}$, what Goodman fatigue factor of safety applies?

- A. 1.51
- B. 1.16
- C. 5.06
- D. 1.38

35. A prismatic bar carries 5176 kN axial tension over a net area of 13190 mm^2 . What is the average normal stress?

- A. 392.42 MPa
- B. 196.21 MPa
- C. 196.62 MPa
- D. 588.63 MPa

36. A solid circular shaft of diameter 58 mm transmits 52280 N·m torque. What is its maximum torsional shear stress?

- A. 682.33 MPa
- B. 2729.3 MPa
- C. 2729.85 MPa
- D. 1364.65 MPa

37. A rectangular beam 5220 mm wide and 5280 mm deep carries a maximum bending moment of 1297.0 kN·m. What is the extreme-fiber bending stress?

- A. 0.05 MPa
- B. 0.03 MPa
- C. 0.44 MPa
- D. 0.58 MPa

38. A steel tie, length 52620 mm and area 13355 mm², carries 5192 kN. Using $E = 200,000$ MPa, what is its elastic elongation?

- A. 51.14 mm
- B. 204.57 mm
- C. 102.28 mm
- D. 51.69 mm

39. A ductile member has yield strength 13110 MPa and calculated von Mises stress 5239 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, $I = 265300000$ mm⁴, and length 66525 mm. What is its Euler critical load?

- A. 473.32 kN
- B. 118.33 kN
- C. 29.58 kN
- D. 37.67 kN

41. Using the relation $T = KFd$, estimate bolt preload when installation torque is 25780 N·m, nut factor $K = 0.2$, and nominal diameter is 16 mm.

- A. 8056.52 kN
- B. 8056.25 kN
- C. 12084.38 kN
- D. 1611.25 kN

42. Two parallel fillet welds, each 5182 mm long with 7 mm leg size, carry 2571 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 50.13 MPa
- B. 70.88 MPa
- C. 35.44 MPa
- D. 100.25 MPa

43. A lap joint uses 4 identical 16-mm-diameter rivets in single shear to carry 5149 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 25609.03 MPa
- B. 3201.13 MPa
- C. 12804.51 MPa
- D. 6402.26 MPa

44. A bolt transfers 5166 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. 8221.94 MPa
- B. 12915 MPa
- C. 25830 MPa
- D. 51660 MPa

45. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 25820 N·m, nut factor $K = 0.2$, and nominal diameter is 17 mm.

- A. 7594.39 kN
- B. 11391.18 kN
- C. 7594.12 kN
- D. 1518.82 kN

46. Two parallel fillet welds, each 5190 mm long with 8 mm leg size, carry 2575 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 43.86 MPa
- B. 62.02 MPa
- C. 31.01 MPa
- D. 87.72 MPa

47. A lap joint uses 4 identical 12-mm-diameter rivets in single shear to carry 5157 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 45597.89 MPa
- B. 5699.74 MPa
- C. 22798.95 MPa
- D. 11399.47 MPa

48. A bolt transfers 5174 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. 7486.07 MPa
- B. 23518.18 MPa
- C. 11759.09 MPa
- D. 47036.36 MPa

49. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 25860 N·m, nut factor $K = 0.2$, and nominal diameter is 18 mm.

- A. 7183.6 kN
- B. 7183.33 kN
- C. 10775 kN
- D. 1436.67 kN

50. Two parallel fillet welds, each 5198 mm long with 6 mm leg size, carry 2579 kN direct shear. Using throat = 0.707h, what average weld throat stress results?

- A. 82.69 MPa
- B. 41.35 MPa
- C. 116.96 MPa
- D. 58.48 MPa

51. A lap joint uses 4 identical 14-mm-diameter rivets in single shear to carry 5165 kN. Assuming equal load sharing, what average shear stress acts in each rivet?

- A. 33552.46 MPa
- B. 4194.06 MPa
- C. 8388.12 MPa
- D. 16776.23 MPa

52. A bolt transfers 5182 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. 21591.67 MPa
- B. 6872.84 MPa
- C. 10795.83 MPa
- D. 43183.33 MPa

53. Using the relation $T = KF_d$, estimate bolt preload when installation torque is 25900 N·m, nut factor $K = 0.2$, and nominal diameter is 16 mm.

- A. 8094.02 kN
- B. 12140.62 kN
- C. 1618.75 kN
- D. 8093.75 kN

54. A 20-tooth pinion rotating at 27250 rpm drives a 58-tooth gear. Neglecting slip, what is the gear speed?

- A. 9396.55 rpm
- B. 4698.28 rpm
- C. 17853.45 rpm
- D. 27250 rpm

55. A shaft transmits 2566 hp at 52220 rpm. Using $T(\text{in} \cdot \text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1548.47 in·lbf
- B. 3096.94 in·lbf
- C. 4645.41 in·lbf
- D. 6193.88 in·lbf

56. An open belt connects a 130-mm driver at 26420 rpm to a 320-mm driven pulley. Neglecting slip, what is driven speed?

- A. 5366.56 rpm
- B. 15686.88 rpm
- C. 10733.12 rpm
- D. 26420 rpm

57. A collar bearing supports 1284.5 kN at mean friction radius 0.020 m with friction coefficient 0.080. What friction torque must be overcome?

- A. 2055.2 N·m
- B. 4110.4 N·m
- C. 3082.8 N·m
- D. 4110.95 N·m

58. A power screw has lead 7 mm, input torque 5153 N·m, and raising efficiency 0.34. What axial load can it raise?

- A. 786.3 kN
- B. 2358.91 kN
- C. 3145.22 kN
- D. 1572.61 kN

59. A 21-tooth pinion rotating at 27300 rpm drives a 60-tooth gear. Neglecting slip, what is the gear speed?

- A. 4777.5 rpm
- B. 9555 rpm
- C. 17745 rpm
- D. 27300 rpm

60. A shaft transmits 2571 hp at 52320 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1548.52 in·lbf
- B. 4645.56 in·lbf
- C. 3097.04 in·lbf
- D. 6194.09 in·lbf

61. An open belt connects a 125-mm driver at 26470 rpm to a 310-mm driven pulley. Neglecting slip, what is driven speed?

- A. 10673.39 rpm
- B. 5336.69 rpm
- C. 15796.61 rpm
- D. 26470 rpm

62. A collar bearing supports 1287.0 kN at mean friction radius 0.022 m with friction coefficient 0.090. What friction torque must be overcome?

- A. 5096.52 N·m
- B. 2548.26 N·m
- C. 3822.39 N·m
- D. 5097.07 N·m

63. A power screw has lead 6 mm, input torque 5163 N·m, and raising efficiency 0.35. What axial load can it raise?

- A. 946.17 kN
- B. 2838.51 kN
- C. 1892.34 kN
- D. 3784.68 kN

64. A 18-tooth pinion rotating at 27350 rpm drives a 54-tooth gear. Neglecting slip, what is the gear speed?

- A. 4558.33 rpm
- B. 18233.33 rpm
- C. 27350 rpm
- D. 9116.67 rpm

65. A shaft transmits 2576 hp at 52420 rpm. Using $T(\text{in}\cdot\text{lbf}) = 63,025 \text{ hp/rpm}$, what torque is transmitted?

- A. 1548.57 in·lbf
- B. 4645.72 in·lbf
- C. 6194.29 in·lbf
- D. 3097.15 in·lbf

66. An open belt connects a 120-mm driver at 26520 rpm to a 300-mm driven pulley. Neglecting slip, what is driven speed?

- A. 5304 rpm
- B. 15912 rpm
- C. 10608 rpm
- D. 26520 rpm

67. An undamped single-degree system has mass 2568 kg and stiffness 1299000 N/m. What is its natural frequency in hertz?

- A. 1.79 Hz
- B. 3.58 Hz
- C. 5.37 Hz
- D. 7.16 Hz

68. A hydraulic cylinder must produce 1287.5 kN using a piston area of 26410 mm². Neglecting losses, what gauge pressure is required?

- A. 48.75 MPa
- B. 24.38 MPa
- C. 24.79 MPa
- D. 97.5 MPa

69. A simply supported beam of span 2.4 m carries a central point load of 2570 kN. What is the maximum bending moment?

- A. 3084 kN·m
- B. 771 kN·m
- C. 1070.83 kN·m
- D. 1542 kN·m

70. A lever has an effort arm of 7779 mm and a load arm of 5146 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 2.27
- C. 1.51
- D. 3.02

71. A 752-V DC source is applied across a 10- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 37.6 A
- B. 75.2 A
- C. 112.8 A
- D. 150.4 A

72. A thin-walled cylindrical vessel has internal pressure 258.5 MPa, inside diameter 13175 mm, and wall thickness 14 mm. What is the membrane hoop stress?

- A. 60816.74 MPa
- B. 121633.48 MPa
- C. 243266.96 MPa
- D. 60817.29 MPa

73. A linear spring has stiffness 2581 kN/m and is compressed 40 mm. What force does it exert?

- A. 103240 N
- B. 51620 N
- C. 154860 N
- D. 51620.55 N

74. An undamped single-degree system has mass 2575 kg and stiffness 1302500 N/m. What is its natural frequency in hertz?

- A. 3.58 Hz
- B. 1.79 Hz
- C. 5.37 Hz
- D. 7.16 Hz

75. A hydraulic cylinder must produce 1291.0 kN using a piston area of 26480 mm². Neglecting losses, what gauge pressure is required?

- A. 24.38 MPa
- B. 24.79 MPa
- C. 97.51 MPa
- D. 48.75 MPa

76. A simply supported beam of span 2.7 m carries a central point load of 2577 kN. What is the maximum bending moment?

- A. 3478.95 kN·m
- B. 869.74 kN·m
- C. 1739.48 kN·m
- D. 954.44 kN·m

77. A lever has an effort arm of 7800 mm and a load arm of 5160 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 1.51
- C. 2.27
- D. 3.02

78. A 754-V DC source is applied across a 7- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 53.86 A
- B. 161.57 A
- C. 107.71 A
- D. 215.43 A

79. A thin-walled cylindrical vessel has internal pressure 259.2 MPa, inside diameter 13210 mm, and wall thickness 12 mm. What is the membrane hoop stress?

- A. 71334 MPa
- B. 285336 MPa
- C. 71334.55 MPa
- D. 142668 MPa

80. A linear spring has stiffness 2588 kN/m and is compressed 46 mm. What force does it exert?

- A. 119048 N
- B. 59524 N
- C. 178572 N
- D. 59524.55 N

81. An undamped single-degree system has mass 2582 kg and stiffness 1306000 N/m. What is its natural frequency in hertz?

- A. 1.79 Hz
- B. 3.58 Hz
- C. 5.37 Hz
- D. 7.16 Hz

82. A hydraulic cylinder must produce 1294.5 kN using a piston area of 26550 mm². Neglecting losses, what gauge pressure is required?

- A. 24.38 MPa
- B. 24.79 MPa
- C. 48.76 MPa
- D. 97.51 MPa

83. A simply supported beam of span 2.6 m carries a central point load of 2584 kN. What is the maximum bending moment?

- A. 1679.6 kN·m
- B. 3359.2 kN·m
- C. 839.8 kN·m
- D. 993.85 kN·m

84. A lever has an effort arm of 7821 mm and a load arm of 5174 mm. Neglecting friction, what is its ideal mechanical advantage?

- A. 0.66
- B. 2.27
- C. 3.02
- D. 1.51

85. A 756-V DC source is applied across a 9- Ω resistive sensor circuit. Neglecting lead resistance, what current flows?

- A. 42 A
- B. 126 A
- C. 168 A
- D. 84 A

86. A thin-walled cylindrical vessel has internal pressure 259.9 MPa, inside diameter 13245 mm, and wall thickness 13 mm. What is the membrane hoop stress?

- A. 66199.53 MPa
- B. 132399.06 MPa
- C. 264798.12 MPa
- D. 66200.08 MPa

87. A linear spring has stiffness 2595 kN/m and is compressed 44 mm. What force does it exert?

- A. 57090 N
- B. 171270 N
- C. 114180 N
- D. 57090.55 N

88. An undamped single-degree system has mass 2589 kg and stiffness 1309500 N/m. What is its natural frequency in hertz?

- A. 3.58 Hz
- B. 1.79 Hz
- C. 5.37 Hz
- D. 7.16 Hz

89. A hydraulic cylinder must produce 1298.0 kN using a piston area of 26620 mm². Neglecting losses, what gauge pressure is required?

- A. 24.38 MPa
- B. 24.79 MPa
- C. 97.52 MPa
- D. 48.76 MPa

90. A machining operation reduces a diameter from 2582 mm to 2578 mm. What percent reduction in diameter occurs?

- A. 0.15 %
- B. 0.16 %
- C. 0.23 %
- D. 0.31 %

91. Four repeated measurements are 75.53, 75.49, 75.52, and 75.50 mm. What is their arithmetic mean?

- A. 37.75 mm
- B. 302.04 mm
- C. 75.51 mm
- D. 75.53 mm

92. A mating hole measures 2577.06 mm and its shaft measures 2576.98 mm. What diametral clearance exists?

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

93. Inspection accepts 13245 of 13265 manufactured parts. What is the observed percent yield?

- A. 49.92 %
- B. 149.77 %
- C. 99.85 %
- D. 100.15 %

94. A machining operation reduces a diameter from 2586 mm to 2582 mm. What percent reduction in diameter occurs?

- A. 0.15 %
- B. 0.42 %
- C. 0.23 %
- D. 0.31 %

95. Four repeated measurements are 75.57, 75.53, 75.56, and 75.54 mm. What is their arithmetic mean?

- A. 37.78 mm

- B. 302.2 mm
- C. 75.57 mm
- D. 75.55 mm

96. A mating hole measures 2581.04 mm and its shaft measures 2580.98 mm. What diametral clearance exists?

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

97. Inspection accepts 13265 of 13285 manufactured parts. What is the observed percent yield?

- A. 49.92 %
- B. 149.77 %
- C. 99.85 %
- D. 100.15 %

98. A machining operation reduces a diameter from 2590 mm to 2586 mm. What percent reduction in diameter occurs?

- A. 0.15 %
- B. 0.42 %
- C. 0.23 %
- D. 0.31 %

99. Four repeated measurements are 75.61, 75.57, 75.60, and 75.58 mm. What is their arithmetic mean?

- A. 37.8 mm
- B. 75.59 mm

- C. 302.36 mm
- D. 75.61 mm

100. A mating hole measures 2585.05 mm and its shaft measures 2584.98 mm. What diametral clearance exists?

- A. 0.05 mm
- B. 0.02 mm
- C. 0.04 mm
- D. 0.07 mm

Practice Exam 16: 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 32588.2 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. 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 20198552.86 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

3. 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 103828.46 \$/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 3.95 . Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis prevents a numerically

5. D — D — Length conversion requires multiplying inches by 25.4 millimeters per inch so the inch unit cancels and millimeters remain. Substitution gives 32639 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 17726968.75 \$/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 103988.46 \$/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 3.95 . 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 32689.8 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. 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 23707045 \$/year. Keeping the calculation consistent with the stated units identifies the keyed option. Checking units and the stated design basis

11. A — A — Average unit cost equals the fixed cost plus the allocated variable cost per unit; costs are combined only after using the common per-unit basis. Substitution gives 104148.46 \$/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 3.95 . 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 32740.6 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 20381347.14 \$/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 104308.46 \$/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 3.95 . 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 — Plane-stress von Mises stress combines both normal stresses and shear through the distortion-energy expression, including three times shear stress squared. Substitution gives 5019.4 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. 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 1.16 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

19. 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 392.37 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

20. 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 1506.87 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

21. D — D — 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 0.05 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

22. A — A — Elastic axial elongation follows $\Delta L = \frac{PL}{AE}$. Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 101.65 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. 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

24. B — B — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\pi^2 EI$ divided by L^2 . Substitution gives 119.04 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

25. 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 5034.89 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 1.16 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

27. 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 392.4 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

28. 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 1887.84 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load

29. D — D — Using $\sigma = Mc/I$ for a rectangle reduces to $6M$ divided by $b h^2$. The moment must be expressed in newton-millimeters. Substitution gives 0.05 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving

30. B — B — Elastic axial elongation follows PL/AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 101.97 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. A — A — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\pi^2 EI$ divided by L^2 . Substitution gives 118.69 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,

- 33. 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 5050.39 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. 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 1.16 . Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load
- 35. 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 392.42 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load
- 36. D — D** — 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 1364.65 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load
- 37. 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 0.05 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving
- 38. C — C** — Elastic axial elongation follows PL divided by AE . Consistent newton and millimeter units make the modulus directly usable in megapascals. Substitution gives 102.28 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. B — B** — Euler buckling for a pin-ended column uses effective length equal to actual length, giving $\pi^2 EI$ divided by L^2 . Substitution gives 118.33 kN. Keeping the calculation consistent with the stated units identifies the keyed option. The competing choices represent common errors involving geometry, load path,
- 41. B — B** — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 8056.25 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

42. A — A — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 50.13 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. 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 6402.26 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting

44. C — C — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 25830 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. C — C — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 7594.12 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 43.86 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 11399.47 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. B — B — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 23518.18 MPa. Keeping the calculation consistent with the stated units identifies the keyed option. Connection calculations must use the actual load path and the resisting area specified

49. B — B — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 7183.33 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

50. D — D — The resisting throat area is two weld lengths multiplied by the effective fillet throat, 0.707 times leg size. Substitution gives 58.48 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. C — C — Equal load sharing divides the applied force among the rivets, and single-shear area is the circular cross-sectional area of one rivet. Substitution gives 8388.12 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. A — A — Average bearing stress uses the projected contact area, bolt diameter times plate thickness, rather than the bolt's circular area. Substitution gives 21591.67 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. D — D — Rearranging the torque-preload approximation gives preload F equal to T divided by K_d , with diameter expressed in meters. Substitution gives 8093.75 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

54. A — A — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 9396.55 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 3096.94 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 $N_1 D_1$ equal to $N_2 D_2$, so driven speed is driver speed times the diameter ratio. Substitution gives 10733.12 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship

57. A — A — Collar friction torque equals friction coefficient times axial load times mean friction radius; kilonewtons are converted to newtons. Substitution gives 2055.2 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. 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 1572.61 kN. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the

59. B — B — For an external gear pair, pitch-line velocity is equal, so rotational speed is inversely proportional to tooth count. Substitution gives 9555 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship help reject the nearby

60. C — C — The stated horsepower-speed relation directly produces torque in inch-pounds; substituting horsepower and rotational speed avoids mixing foot-pounds and inch-pounds. Substitution gives 3097.04 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. 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 10673.39 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 2548.26 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. 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 1892.34 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 9116.67 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. D — D — 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 3097.15 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. 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 10608 rpm. Keeping the calculation consistent with the stated units identifies the keyed option. A dimensional check and a comparison with the operating relationship

67. B — B — 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 3.58 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

68. A — A — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 48.75 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

69. 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 $1542 \text{ kN}\cdot\text{m}$. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

70. 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 1.51 . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding,

71. B — B — Ohm's law gives current as applied voltage divided by resistance. Multiplication gives power-related units, while the inverse ratio has incorrect dimensions. Substitution gives 75.2 A . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

72. B — B — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 121633.48 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

73. 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 103240 N . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

74. 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 3.58 Hz . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

75. D — D — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 48.75 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

76. 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 $1739.48 \text{ kN}\cdot\text{m}$. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

77. 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 1.51 . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding,

78. 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 107.71 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

79. D — D — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 142668 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

80. 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 119048 N. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

81. 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 3.58 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

82. C — C — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 48.76 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

83. A — A — For a simply supported beam with a centered point load, reactions are equal and the maximum moment at midspan is PL divided by four. Substitution gives 1679.6 kN·m. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before

84. 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 1.51 . Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding,

85. 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 84 A. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied before rounding, because premature

86. B — B — Thin-cylinder hoop stress equals pressure times diameter divided by twice wall thickness; longitudinal stress would be half this value. Substitution gives 132399.06 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

87. 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 114180 N. 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 — 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 3.58 Hz. Keeping the calculation consistent with the stated units identifies the keyed option. The governing component relation must be applied

89. D — D — Hydraulic pressure equals force divided by piston area. Newtons per square millimeter are numerically megapascals. Substitution gives 48.76 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

90. A — A — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.15 %. 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. C — C — The arithmetic mean is the sum of all readings divided by their count. Range and total are not estimates of the central measured value. Substitution gives 75.51 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

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

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 99.85 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,

94. A — A — Percent reduction uses the original dimension as the reference denominator, after determining the absolute decrease. Substitution gives 0.15 %. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent, and the measurement definition used in the

95. D — D — The arithmetic mean is the sum of all readings divided by their count. Range and total are not estimates of the central measured value. Substitution gives 75.55 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

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

97. 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 99.85 %. 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 0.15 %. 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. B — B — The arithmetic mean is the sum of all readings divided by their count. Range and total are not estimates of the central measured value. Substitution gives 75.59 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units,

100. 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 0.07 mm. Keeping the calculation consistent with the stated units identifies the keyed option. The result should also be checked against units, manufacturing intent,