IBONG TIRIRIT (MDSP 2)

1. Select a deep-groove ball bearing to carry a radial load F_x = 800 lb and a thrust load F_z = 700 lb at 1800 rpm. The service is 8 hr/day, but it is not continuous; design for 18 250 hr. The operation is smooth with little vibration; the outer ring rotates. Determine the design life in million revolution (mr) with no more than 10 % failure.
   a) 1791 mr **b) 1971 mr** c) 1197 mr d) 1917 mr

2. If the ultimate shear strength of a steel plates is 42 000 psi, what force is necessary to punch a 0.75 inch diameter hole in a 0.625 inch thick plate?
   a) 61 850 lb b) 65 810 lb c) 61 580 lb d) 60 185 lb

3. Find the pressure required to punch a 1-inch square hole in ¼ -inch thick steel.
   a) 20.67 tons b) 26.76 tons **c) 26.67 tons** d) 26.67 tons

4. What length of a square key is required for a 4-in diameter shaft transmitting 1000 hp at 1000 rpm? The allowable shear and compressive stresses in the key are 15 ksi and 30 ksi, respectively.
   a) **2.1 inches** b) 2.8 inches c) 3.2 inches d) 4.2 inche

5. A flange coupling is to transmit 15,000 in-lb between two 2.5" diameter shafts. How many ½" diameter bolts in a 6" diameter bolt circle are required if the shear stress in each bolt is limited to 3000 psi?
   a) 9 bolts b) 7 bolts c) 6 bolts d) 8 bolts

6. Determine the radius of gyration of a wheel that has an outside and inside diameters of 1 meter and 0.75 meter, respectively? Neglect its hub and arms.
   a) 0.5125 m b) 0.6125 m c) **0.3125 m** d) 0.4125 m

7. What is the polar section modulus of a solid shaft with a diameter of 101.6 mm?
   a) 209.5 cm^3 b) 209.5 cm^4 **c) 205.9 cm^3** d) 205.9 cm^4

8. If the angular deformation of a solid shaft should not to exceed 1^o in a length of 1.8 m and the allowable shearing stress is 83 MMa, what is the diameter of the shaft? Assume that the shaft material has G = 77 x 10^6 kPa.
   a) 222.34 mm b) 234.22 mm c) 23.42 cm d) 24.22 cm

9. What modulus of elasticity in tension is required to obtain a unit deformation of 0.00105 from a load producing a unit tensile stress of 3163.27 kg/cm^2?
   a) 40 x 10^6 psi **b) 43 x 10^6 psi** c) 45 x 10^6 psi d) 46 x 10^6 psi

10. If the ultimate shear strength of a steel plates is 42 000 psi, what force is necessary to punch a 0.75 inch diameter hole in a 0.625 inch thick plate?
    a) 61 850 lb b) 65 810 lb c) 61 580 lb d) 60 185 lb

11. Determine the tensile stress area of an American Standard Screw Threads 6-32 UNC with basic major diameter of 0.1380 inch.
    a) 9.085 x 10^{-3} in^2 b) 9.085 x 10^{-2} in^2 c) 9.085 x 10^{-4} in^2 d) 9.085 x 10^{-5} in^2

12. What is the number of threads per mm and the tensile stress area of a standard Metric screw Thread designated by M10 x 1.5?
    a) 0.555 and 57.99 mm^2 **b) 0.667** and 57.99 mm^2 c) 1.5 and 57.99mm^2 d) 1.75 and 57.99 mm^2

13. A line shaft is to transmit 200 Hp at 900 rpm. Find the diameter of the shaft.
    a) 2.18 inches **b) 2.28 inches** c) 3.18 inches d) 3.28 inches

14. A round steel shaft rotates at 200 rpm and is subjected to a torque of 275 N-m and a bending moment of 415 N-m. Determine the equivalent twisting moment.
    a) 597.84 N-m b) 456.42 N-m c) 546.43 N-m **d) 497.85 N-m**

15. A 75-mm diameter shaft is transmitting 300 kW at 600 rpm. A flange coupling is used and has 6 bolts, each 18 mm in diameter. Find the required diameter of the bolts circle based on an average shearing stress of 27.5 MPa.
    a) 227.4 mm b) 477.2 mm c) 274.7 mm d) 247.7 mm

16. A 1.75-inch-diameter shaft is supported by two sleeve bearings. The total load on the two bearings is 2800 lb. Find the friction power loss, in Hp, if the coefficient of friction between shaft and bearing is 0.10 and the shaft rotates 200 rpm.
a) 0.88 Hp **b) 0.78 Hp** c) 0.98 Hp d) 0.68 Hp

17. Determine the Hp lost when a collar is loaded with 2000 lb, rotates at 50 rpm, and has a coefficient of friction of 0.15. The outside diameter of the collar is 4 inches and the inside diameter is 2 inches.
a) 0.7314 Hp **b) 0.3714 Hp** c) 0.4713 Hp d) 0.4371 Hp

18. A vertical steel cylinder water tank is 30 m in diameter and 45 m high. The allowable stress of the steel plate is 1224 kg/cm^2. Without reinforcing angle bars and rods, what is the thickness of the steel plate?
a) 55.15 mm b) 51.55 mm c) 65.15 mm d) 61.55 mm

19. What is the bursting steam pressure of a hemispherical steel shell with a diameter of 100 inches and made of 0.0635-m thick steel plate, if the joint efficiency is 70 % and the tensile strength is 60 000 psi?
a) 4 020 psi **b) 4 200 psi** c) 2 400 psi d) 2 040 psi

20. The root diameter of a double square thread is 0.55 inch. The screw has a pitch of 0.2 inch. Find the outside diameter and the number of thread per inch.
a) 0.2 threads/inch b) 10 threads/inch **c) 5 threads/inch** d) 2.5 threads/inch

21. Two shafts 3.6 m between centers carry pulleys 1.2 m in diameter and 0.91 m in diameter respectively, connected by a crossed belt. It is desired to put the belt on as an open belt. How long a piece must be cut of it?
a) 303.3 mm b) 330 mm c) 333.0 mm d) 330.3 mm

22. A flat belt is 6 inches wide and 1/3 inch thick and transmits 15 Hp. The center distance is 8 ft. The driving pulley is 6 inches in diameter and rotates at 2 000 rpm such that the loose side of the belt is on top. The driven pulley is 18 inches in diameter. The belt material is 0.035 lb/in^3 and the coefficient of friction is 0.30. Determine the belt net tension.
a) 175.5 lb **b) 157.5 lb** c) 155.7 lb d) 165.7 lb

23. A pulley 600 mm in diameter transmits 40 kW at 500 rpm. The arc of contact between the belt and pulley is 144°, the coefficient of friction between belt and pulley is 0.35 and the safe working stress of the belt is 2.1 MPa. Determine the belt tensions ratio, neglecting the effect of centrifugal force.
a) 2.41 b) 2.14 c) 1.24 d) 4.12

24. A roller chain and sprocket is to drive vertical centrifugal discharge bucket elevator. The pitch of chain connecting sprockets is 1.75". The driving sprocket is rotating at 120 rpm and has 11 teeth while the driven sprocket is rotating at 38 rpm. Determine the number of teeth of driven sprocket.
a) 33 teeth **b) 35 teeth** c) 30 teeth d) 34 teeth

25. A helical steel spring has a maximum load of 800 lb and a corresponding deflection of 2 inches. If it has 8 active coils and an index of 6, what minimum shear strength of the spring material is required?
a) 57 ksi b) 47 ksi **c) 67 ksi** d) 37 ksi

26. A helical-coil spring has a mean coil diameter of 1 inch and a wire diameter of 1/8 inch. Determine the value of Bergstrasssar factor of the spring.
a) 1.172 b) 1.712 c) 1.217 d) 1.271

27. A precision cut gear transmits 25 Hp at a pitch line velocity of 6000 fpm. If the service is intermittent, find the dynamic load.
a) 247.05 lb **b) 274.05 lb** c) 275.04 lb d) 247.05 lb

28. What is the difference of the values of the Wahl factor and the Bergstrasser factor, in percentage?
a) 1 % **b) Less than 1 %** c) Greater than 1 % d) 0.5 %

29. A double-thread worm has a pitch diameter of 3 inches. The wheel has 20 teeth and a pitch diameter of 5 inches. Find the gear helix angle.
a) 4.69° **b) 9.46°** c) 6.49° d) 6.94°

30. A helical-coil spring has a mean coil diameter of 1 inch and a wire diameter of 1/8 inch. Determine the shear-stress augmentation factor of the spring.
a) 1.625 **b) 1.0625** c) 1.0256 d) 1.0526

31. A disc clutch has 6 pairs of contacting friction surfaces with an outside diameter of 200 mm and an inside diameter of 100 mm. The coefficient of friction of the clutch materials is 0.4 and the axial force is 1500 N. The shaft speed is 1200 rpm. Determine the Hp that can be transmitted by the clutch assuming uniform pressure.
a) 35.2 Hp b) 23.5 Hp **c) 47.2 Hp** d) 27.4 Hp

32. A flywheel has a mean diameter of 4 ft and is required to handle 2250 ft-lb of kinetic energy. It has a width of 8 inches, mean operating speed is 300 rpm and the coefficient of fluctuation is to be 0.05. Find the weight of rim, assuming that the arms and hub are equivalent to 10 % of the total rim weight. The flywheel is made up of cast iron with specific weight of 0.26 lb per cubic inch.
a) 333.7 lb b) 373.3 lb c) 337.3 lb d) 733.3 lb

33. A 20º involute spur gear has a tooth whole depth of 16.95 mm, a tooth thickness of 13.2 mm, and a pitch of 3. Determine the circular pitch of the gear.
a) 26.6 mm b) 16.6 mm c) 25.6 mm d) 24.6 mm

34. A parallel helical gear-set consists of a 19-tooth pinion driving a 57-teeth gear. The pinion has a left-hand helix angle of 20º, a normal pressure angle of 14½º, and a normal diametal pitch of 10 teeth/inch. If the pinion is to transmit 50 Hp at a speed of 1750 rpm. Determine the center distance of the two gears.
a) 2.02 inches b) 6.06 inches **c) 4.04 inches** d) 2.06 inches

35. A right-handed single-thread hardened-steel worm has a catalog rating of 2.25 kW at 650 rpm when meshed with a 48-tooth cast-steel gear. The axial pitch of the worm is 25 mm, normal pressure angle is 14.5º, and the pitch diameter of the worm is 100 mm. The coefficient of friction is 0.085. Determine the shafts center distance.
a) 241 mm b) 142 mm c) 412 mm d) 124 mm

36. A 20º straight-tooth bevel pinion having 14 teeth and a diametral pitch of 6 teeth/inch drives a 42-tooth gear. The two shafts are at right angles and in the same plane. Find the pitch angle of the pinion.
a) **18.4º** b) 20º c) 14.5º d) 20.5º

37. A triple-thread worm has a lead angle of 17º and a pitch diameter of 2.2802 inches. Find the center distance when the worm is mated with a wheel of 48 teeth.
a) 6.72 inches b) 7.26 inches c) 6.27 inches d) 7.62 inches

38. A double-thread worm has a pitch diameter of 3 inches. The wheel has 20 teeth and a pitch diameter of 5 inches. Find the gear helix angle.
a) 4.69º **b) 9.46º** c) 6.49º d) 6.94º

39. A 36-tooth pinion turning at 300 rpm drives 120-tooth gear of 14.5º involute full depth pressure angle. Determine the rpm of the driven gear.
a) 60 rpm b) 45 rpm c) 75 rpm **d) 90 rpm**

40. Three extension springs are hooked in series that support a single weight of 100 kg. The first spring is rated at 4 kN/m and the other two springs are rated 6 kN/m each. Determine the equivalent stiffness of the three springs.
a) 1.71 kN/m b) 5 kN/m c) 2.71 kN/m d) 3.71 kN/m

41. Three extension springs are hooked in parallel that support a single weight of 100 kg. The springs are rated 4 kN/m, 5 kN/m, and 6 kN/m, respectively. Determine the equivalent spring constant of the three springs.
a) 10 kN/m **b) 15 kN/m** c) 9 kN/m d) 11 kN/m

42. A single square thread power screw is to raise a load of 70 kN. The screw has a major diameter of 36 mm and a pitch of 6 mm. The coefficient of thread friction and collar friction are 0.13 and 0.10 respectively. If the collar mean diameter is 90 mm and the screw turns at 60 rpm, find the axial linear speed of the screw.
a) 5 mm/s **b) 6 mm/s** c) 7 mm/s d) 5.5 mm/s

43. A double thread ACME screw driven by a motor at 400 rpm raises the attached load of 900 kg at a speed of 10 m/min. The screw has a pitch diameter of 36 mm; the coefficient of friction on threads is 0.15. The friction torque on the thrust bearing of the motor is taken as 20 % of the total input. Determine the lead angle.
a) 12.465º b) 14.265º c) 15.462º d) 16.452º

44. What is the minimum clearance allowed for meshing spur gears with diametral pitch of 20? The spur gear has 25 teeth.
a) 0.00785 inch b) 0.00758 inch c) 0.00857 inch d) 0.00758 inch

45. A wire rope lifts a load of 10 kips at a maximum speed of 1000 feet per minute, attained in 5 seconds starting from rest. The rope has a metallic cross sectional area of 0.4 in^2. Determine the maximum tensile stress on the rope in ksi.
a) 26.2 b) 25.0 c) **27.6** d) 32.4

46. A casting weighing 300 pounds is to be lifted by means of an overhead crane. The casting is lifted 10 feet in 12 seconds. What is the horsepower developed?
a) 0.54 b) 0.84 c) 0.95 d) **0.45**

47. What wall thickness is required for a 500mm diameter cylinder under an internal pressure of 20 MPa? Use a design stress of 80 MPa.
a) **73 mm** b) 53 mm c) 63 mm d) 83 mm

48. This type of spring incorporates a standard helical compression spring with two looped wire devices inserted through the inside of spring.
a) Helical compression spring **b) Drawbar spring** c) Helical extension spring d) Leaf spring

49. In a straight bevel gear, how do you call the angle between an element on the pitch cone and an element on the face cone?
a) Face angle b) Pitch angle **c) Addendum angle** d) Dedendum angle

50. How do you call a large wood screw that is used to fasten machinery and equipment to a wooden base?
a) Lag screw b) Wood screw c) Log screw d) Square screw

51. A journal bearing with angle of contact of the bushing or bearing with the journal is 180° or less, 120° is the common value.
a) Partial journal bearing b) Full journal bearing c) Clearance journal bearing d) Concentric journal bearing

52. A journal bearing where the radius of the journal is less than the radius of the bushing or bearing.
a) Fitted journal bearing b) **Clearance journal bearing** c) Full journal bearing d) Partial journal bearing

53. It refers to the thickness of the space allowed for the lubricant that separates the parts having relative motion.
a) Radial clearance b) Diametral clearance c) Film thickness d) **Clearance**

54. A journal bearing where the radii of the journal and the bushing are equal; it must be a partial bearing and the journal must run eccentric with the bushing in order to provide space for the lubricant.
a) Fitted journal bearing b) Clearance journal bearing c) Full journal bearing d) Partial journal bearing

55. A partial journal bearing where the line of action of the load or bearing reaction is bisecting the arc of the partial bearing.
a) Partially loaded bearing b) Eccentrically loaded bearing
c) **Centrally loaded bearing** d) Fully loaded bearing

56. A journal bearing where the line of action of the load is passing to one side of the center.
a) Centrally loaded bearing b) **Eccentrically loaded or offset bearing**
c) Fully loaded bearing d) Partially loaded bearing

57. Which of the following threads are used for power screw?
a) Square thread, Acme thread, & Unified thread b) Acme thread, Unified thread, & Buttress thread
c) Square thread, Unified thread, & Acme thread d) **Square thread, Acme thread, & Buttress Thread**

58. A bearing lubrication obtained by introducing the lubricant, which is sometimes air or water, into the load-bearing area at a pressure high enough to separate the surfaces with a relatively thick film of lubricant. This lubrication does not require motion of one surface relative to another.
a) Hydrodynamic lubrication b) **Hydrostatic lubrication** c) Boundary lubrication d) Solid film lubrication

59. An externally threaded fastener intended to be used with nut is said to be a:
a) Bolt b) Cap screw c) Allen screw d) Power screw

60. It is a lubrication condition where non-conformal surfaces are completely separated by lubricant film and no asperities are in contact.
a) Elastohydrodynamic lubrication b) Solid film lubrication c) Boundary lubrication d) Hydrodynamic lubrication

61. Which of the following are the compositions of stainless steel 302?
a) 18 % chromium and 8 % nickel b) 18 % nickel and 8 % chromium

c) 18 % chromium and 8 % phosphor bronze d) 18 % bronze and 8 % vanadium

62. These springs are made from one or more flat strips of brass, bronze, steel or other materials loaded as cantilevers or simple beam.
a) Torsion springs **b) Leaf springs** c) Garter springs d) Drawbar springs

63. This refers to the space between adjacent coils when the spring is compressed to its operating length.
a) Coil clearance b) Pitch c) Lead d) Deflection

64. This material is the most popular alloy spring steel for conditions involving higher stresses than can be used with the high-carbon steels and for use where fatigue resistance and long endurance are needed; this is also good for shock and impact loads.
a) Chrome silicon **b) Chrome vanadium** c) hard-drawn wire d) Oil-tempered wi

65. For an American Standard Screw Threads, what does 6-32 UNC designate?
a) Size 6, 32 threads per inch, coarse thread b) 6 inches basic diameter, 32 threads per inch, coarse thread
c) Size 6, 32 threads per inch, fine thread d) 32 inches basic diameter, 6 threads per inch, coarse thread

Note: 6 stands for the designated size, 32 stands for the number of threads per inch, UNC stands for Coarse threads

66. It is a Grashof four-bar mechanism in which the shortest link is the frame or fixed link and the other two cranks completely rotate with their axes. How do you call this Grashof four-bar mechanism?
a) Drag-link mechanism b) Crank-rocker mechanism
c) Double-rocker mechanism d) Triple-rocker mechanism

67. "For a planar four-bar linkage, the sum of the shortest and longest lengths cannot be greater than the sum of the remaining two link lengths if there is to be a continuous relative rotation between two members." How do you call the preceding statement?
a) Grubler's Law b) Coriolli's Law **c) Grashof's Law** d) Freudentein's Law

68. Which of the following is not true for an instant center or centro of planar linkages?
a) Centro is a point common to two bodies having the same velocity in each.
b) Centro is a point in one body about which another body does not rotate.
c) Centro is a point in one body about which another body actually turns.
d) Centro is a point in one body about which another body tends to turn.

69. This is the most common work holding device of a shaper machine with the base graduated in degrees that make it possible to swivel any angle. What is this working device?
a) Shaper vise b) Parallel bars and hold down bars c) Lathe holder d) Swivel head

70. This is a shaper operation, which is shaping the given stock and having the excess material remain with a tolerable allowance for finishing. How do you call this operation?
a) Roughing b) Finishing c) Angular cutting d) Contouring

71. How do you call a cutting tool that has two or more cutting edges as in drill presses and milling machine cutters?
a) Grinder b) Single-point cutting tool
c) Multi-point cutting tool d) Two point cutting tool

72. This is the trade name for a patented alloy made up chiefly of cobalt, chromium, and tungsten in varying proportions. What is this trade name?
a) Stellite b) Carboloy c) Stainless steel d) Copper

73. It is called as the transformation of concepts and ideas into useful machinery. What is this?
a) Design b) Synthesis c) Analysis d) Theorem

74. This is a combination of mechanisms and other components that transforms, transmits, or uses energy, load, or motion for a specific purpose. How do yopu call this?
a) Mechanism b) Engine **c) Machine** d) Linkage

75. It is defined as synergistic collection of machine elements; synergistic because as a design it represents an idea or concept greater than the sum of the individual pats. What is this system?
a) System of mechanisms **b) Mechanical system** c) Design system d) Expert system

76. It may be defined as the displacement per length produced in a solid and as the result of stress. How do you call this?
a) Deformation b) Elongation **c) Strain** d) Stress

77. What is the combination of applied normal and shear stresses that produces maximum principal normal stress or minimum principal normal stress, with a third principal stress between or equivalent to the extremes?
a) Principal shear stress **b) Principal normal stress**
c) Maximum shear stress d) Bending and shear stresses

78. How do you call a load that is applied transversely to longitudinal axis of member?
a) Combined loads b) Concentrated load **c) Bending load** d) Distributed load

79. It is the capacity of a material to absorb energy when it is deformed elastically and then, upon unloading, to increase this energy. What is this capacity of a material?
a) Resilience b) Toughness c) Rigidity d) Ductility

80. How do you call the strain energy per unit volume required to stress a material from an unloaded state to the point of yielding?
a) Modulus of roughness b) Modulus of elasticity c) Modulus of rigidity **d) Modulus of resilience**

81. What is the ability of the material to absorb energy up to fracture?
a) Toughness b) Rigidity c) Resilience d) Stiffness

82. What is the other term for the Maximum-Shear-Stress Theory, as a failure prediction theory?
a) von Mises criterion **b) Tresca yield criterion**
c) Coulomb-Mohr theory d) Modified Mohr theory

83. It is a failure prediction theory, which states that a part subjected to any combination of loads will fail (by yielding or fracturing) whenever the maximum shear stress exceeds a critical value. How do you call this failure prediction theory?
a) Distortion-energy theory **b) Maximum-shear-stress theory**
c) Internal friction theory d) Modified Mohr theory

84. This is a theory in cyclic and impact loading, which states that damage at any stress level, is proportional to number of cycles. What is this theory commonly called?
a) Miner's Rule b) Paris Power Law c) Goodman Rule d) Manson-Coffin Relationship

85. This is a lubrication where the load-carrying surfaces of the bearing are separated by a relatively thick film of lubricant, so as to prevent metal-to-metal contact; and where the stability of the film can be explained by the laws of fluid mechanics. How do you call this type of lubrication?
a) Hydrostatic lubrication **b) Hydrodynamic lubrication**
c) Elastohydrodynamic lubrication d) Boundary lubrication

86. How do call the speed at which a rotating shaft becomes dynamically unstable?
a) Normal speed b) Variable speed **c) Critical speed** d) Average speed

87. How do you call a ball bearing with race containing pronounced groove for rolling elements?
a) Crown bearing **b) Conrad bearing** c) Angular-contact bearing d) Cylindrical bearing

88. This is a machining process for producing internal straight cylindrical surface or profiles, with process characteristics and tooling similar to those for turning operations. What is this machining process?
a) Boring b) Drilling c) Reaming d) Milling

89. What is a set of specification for parts, materials, or processes intended to achieve uniformity, efficiency, and a specified quality?
a) Code **b) Standard** c) Law d) Theorem

90. This is a set of specifications for the analysis, design, manufacture, and construction of something; the purpose of which is to achieve a specified degree of safety, efficiency, and performance or quality. How do you call this set of specifications?
a) Code b) Standard c) Law d) Theorem

91. How do call the size to which limits or deviations is assigned and is the same for both members of the fit; it is the exact theoretical size?
a) Nominal size **b) Basic size** c) Maximum size d) Minimum size

92. What is the algebraic difference between a size and the corresponding basic size?
a) Tolerance b) Allowance **c) Deviation** d) Limit

93. What is the difference between the maximum and minimum size limits of a part?
a) Allowance **b) Tolerance** c) Deviation d) Basic size

94. What are the stated maximum and minimum dimensions?
a) Tolerances **b) Limits** c) Nominal sizes d) Basic sizes

95. This is a general term that refers to the mating of cylindrical parts such as bolt or a hole; it is used only when the internal member is smaller that the external member. How do you call this?
a) Clearance b) Interference c) Allowance d) Tolerance

96. What is the opposite of clearance, for mating cylindrical parts in which the internal member is larger than the external member?
a) Clearance b) Allowance c) Tolerance **d) Interference**

97. These are compounds of metallic elements, most frequently oxides, nitrides, and carbides.
a) Plastics b) Polymers **c) Ceramics** d) Alloy

98. What do you call a material having different properties in all directions at point in solid?
a) Isotropic material **b) Anisotropic material** c) Orthotropic material d) Ceramic material

99. This is a principle or method that a deflection at any point in bar is equal to sum of deflections caused by each load acting separately. How do you call this method or principle?
a) Summation Method b) Method of balancing
c) Method of superposition d) Shear and Moment diagram method

100. This is the accepted standard wire rope with the wires twisted in one direction to from strands and the strands twisted in opposite direction to form a rope. How do you call this wire rope?
a) Improved plow steel wire rope **b) Regular lang lay wire rope**
c) Mild plow steel wire rope d) Long lay wire rope

101. What is a form of correction that develops on highly localized areas on a metal surface?
a) Crevice b) Erosion c) Galvanic d) **Apitting**

102. How do you call the corrosion of iron-base-alloys?
a) Rusting b) Crazing c) Chalking d) Fritting

103. Which of the following is the allowable stress that is generally used in practice for main transmitting shafts?
a) 8 500 psi **b) 4 000 psi** c) 6 000 psi d) 6 500 psi

104. What is an equation used to determine the first critical speed of the shaft that overestimates frequency?
a) Soderberg Equation **b) Rayleigh Equation** c) Dunkerly Equation d) Euler Equation

105. This key allows the hub to move along the shaft but prevents the rotation of the shaft. How do you call this key?
a) Woodruff key **b) Feather key** c) Gibs key d) Square key

106. How do you call the ratio of mean diameter of coil and the coil diameter of a spring?
a) Wahl number b) Diameter ratio **c) Spring index** d) Lead angle

107. For ACME thread the pressure angle normal to the thread is equal to:
a) 12.5^{o} **b) 14.5^{o}** c) 13.5^{o} d) 34^{o}

108. It is a low cost spring material, suitable where service is not severe and dimensional precision is not needed. How do you call this spring material?
a) Hard drawn wire b) helical spring wire c) Stainless steel d) helical tension spring wire
109. How do you call a spring material that is hard drawn (80 % reduction) but made up of high-grade steel?
a**) Music wire** b) Oil tempered wire c) Song wire d) Chromium-silicon wire

110. It is a design approach where no catastrophic loss can occur as a result of a component failure. What is this design approach?
a) Fail-safe design approach b) Fault free analysis approach
c) Manifest danger approach d) Redundancy approach
111. In a lathe machine, how do you call the diameter of the largest workpiece that can be rotated in a chuck or between centers without hitting the bed?
a) Chuck diameter b) **Swing** c) Distance between centers d) Spindle diameter

112. How do you call a phenomenon when two touching surfaces have a high contact pressure and when these surfaces have minute relative motion?
a) Pre-stressing b) Friction c) Carving d) **Fretting**

113. What is this part of headstock of a lathe machine used to transmit power from the spindle?
a) Motor b) **Back gear** c) Headstock spindle d) Switch
114. When a hot part is cooled suddenly by quenching, there is momentarily a high temperature gradient that induces a stress gradient. Some metal parts under certain conditions crack as a result. What is this phenomenon?
a**) Thermal-shock failure** b) Thermal fatigue c) Honing d) Quenching

115. When a hot part is cooled suddenly by quenching, there is momentarily a high temperature gradient that induces a stress gradient. Some metal parts under certain conditions crack as a result. How do you call this phenomenon?
a**) Thermal-shock failure** b) Thermal fatigue c) Honing d) Quenching
116. It is the condition of a machine element when it is completely inoperable, cannot perform its intended function adequately, or is unreliable for continued safe use. What do you call this condition?
a) Fail-safe condition **b) Failure condition** c) Critical condition d) Salvage condition
117. How do you call a statistical data used to identify the most likely failure modes?
a) Finite element analysis **b) Fault free analysis** c) Failure analysis d) Random analysis
118. It is a computational method used for solving complex shapes, such as those found in machinery; replaces the complex shape with a set of simple elements interconnected at a finite set of a specific purpose. What is this computational method?
a) Finite element analysis b) Numerical method of analysis c) Fault free analysis d) Synthesis

119. It is a design approach where needed service is made apparent before catastrophic failure. How do you call this?
a) Manifest danger design approach b) Machine element function approach
c) Failure analysis d) Random analysis
120. It is a beam where one end is fixed and other end is free. How do you call this beam?
a) Cantilever beam b) Continues beam c) Overhanging beam d) Long beam
121. It is a method used to graphically visualize state of stress acting in different planes passing through a given point. What is this?
a) Mohr's circle b) Soderberg Criterion c) Goodmann's method d) Gerber's line criterion
122. This minimum distance is measured between the non-driving side of a tooth and the adjacent side of the mating tooth. It is the amount by which the width of a tooth space exceeds the thickness of the engaging tooth measured on the pitch circle. What is this distance?
a) Circular pitch b) Whole depth c) **Backlash** d) Space width
123. It is an arc of the pitch circle of a spur gear through which a tooth travels from the point of contact with the mating tooth to the pitch point. What is this arc?
a) Arc of action b) **Arc of approach** c) Arc of recess d) Involute curve
124. What is the intersection of the elements making up the pitch cone?
a) Pitch cone b) Cone distance **c) Apex of pitch cone** d) Root cone

125. What do you call a type of bolt threaded on both ends and can be used where a through bolt is impossible?
a) Coupling bolt b) Machine bolt **c) Stud bolt** d) Carriage bolt
126. To avoid excessive wear rate, what is the recommended limiting pressure for 6 x 19 rope for cast iron?
a) 200 psi b) 400 psi c) 300 psi **d) 500 psi**

127. How do you call a type of welding where the arc is covered with a welding composition and a bare electrode wire is fed automatically?

a) Resistance welding **b) Submerged arc welding** c) Induction welding d) Spot welding

128. It is a kind of wear that occurs because of fatigue failure of the surface materials as a result of high contact stresses. What do you call this?
a) Slotting **b) Pitting** c) Involuting d) Curving

129. It is caused by foreign matters, such as grit or metal particles, or by a failure of the oil film at low speed. How do yopu call this?
a) Auction b) Scoring **c) Abrasion** d) Corrosion

130. It occurs when the oil films fails, but in this case, the load and speed are so high that the metal is melted and the metal is smeared down the profile. What is this?
a) Abrasion b) Corrosion c) Spalling **d) Scoring**

131. In gearing system, it is the advance of the tooth in the face width divided by circular pitch. What do you call this?
a) Face contact ratio b) Speed ratio c) Profile ratio d) Advance ratio

132. When the pitch line speed is above 8000 fpm, the teeth should be _____.
a) Ground after hardening b) Should be cooled in air
c) Should not be quenched after hardening` d) none of these

133. How do you call a spring material that is hard drawn (80 % reduction) but made up of high-grade steel?
a**) Music wire** b) Oil tempered wire c) Song wire d) Chromium-silicon wire

134. It is a spring wire with good quality for impact loads and moderately high temperatures. What is this spring material?
a) Hard drawn spring wire b) helical spring wire **c) Chromium-silicon** d) Helical tension wire

135. It is a type of coil spring where the helical coil is wrapped into a circle forming an annular ring. How do you call this spring?
a) Volute spring b) Motor spring c) Hair spring d) **Garter spring**

136. It is a type of spring where thin flat strip wound up on itself as a plane spiral, usually anchored at the inside end. What do you call this spring?
a) Volute spring **b) Motor spring** c) Hair spring d) Garter spring

137. What do you call a ratio of the length of the column and the radius of gyration of the cross-sectional area about the centroidal axis?
a) Power factor b) Contact ratio d) Constant ratio **d) Slenderness ratio**

138. A screw that requires a positive torque to lower the load, or to loosen the screw if it has been turned tight against a resistance. How do you call this screw?
a) Power screw b) Self screw c) Lock screw **d) Self-locking screw**

139. What is the other term used for Kennedy key?
a) **Tangential key** b) Normal key c) Saddle key d) Rollpin key

140. Which of the following device used to measure the speed accurately?
a) Dial gage b) Dial indicator c) Speedometer d) **Tachometer**

141. When the hole is smaller than the shaft, it will take pressure to put the parts together. The allowance is said to be negative and is termed as:
a) Interference of metal b) Negative allowance
c) Negative tolerance d) Negative fits

142. When two elastic bodies collide, which of the following laws can be used to solve for the resulting velocity?
a) Avogadro's law b) **Conservation of momentum and conservation of energy**
c) Dalton's law of partial pressure c) Conservation of energy

143. It is a science of motion that can be solved in terms of scalar or vector algebra. How do you cal this science?
a) Kinematics b) Dynamics of machine
c) Engineering mechanics d) Strength of materials

144. What is a screw fastener with a nut on it?
a) Bolt b) Rivet c) Fastener d) Square screw

145. It is a type of bolt distinguished by a short portion of shank underneath the head, being square or finned or ribbed. What is this bolt?
a) Coupling bolt b) Machine bolt c) Stud bolt d**) Carriage bolt**

146. Non-ferrous filler metal is melted into grooves or as fillet on the mother metal; the base metal is not melted. This is commonly used for joining iron based machine parts or in repair works of some materials. It is called:
a) Spot welding **b) Braze welding** c) Brazing d) Gas welding

147. It is advised that in rubber belts applications/mountings, it should have an initial tension of:
a) 18 to 24 lb/inch-ply **b) 15 to 20 lb/inch-ply** c) 12 to 15 lb/inch-ply d) 10 lb/inch-ply

148. Normal stress relieving temperature for cast iron:
a) 200 to 350 ^{o}F b) 400 to 500 ^{o}F c) 300 to 550 ^{o}F **d) 450 to 550 ^{o}F**

149. A flexible coupling consists of essentially of two chain sprockets connected with short continuous length of roller or silent chains.
a) Chain coupling b) Oldham coupling c) Flanged coupling d) Universal joint
150. A material of construction (only developed commercially in the late 1940's concurrently with zirconium) offers the unique combination of wide ranging corrosion resistance, low density, and high strength.
a) **Titanium** b) Tungsten c) Vanadium d) Molybdenum