56. A body of mass (M) 10 kg is initially stationary on a 45° inclined plane as shown in figure. The coefficient of dynamic friction between the body and the plane is 0.5. The body slides down the plane and attains a velocity of 20 m/s. The distance travelled (in meter) by the body along the plane is
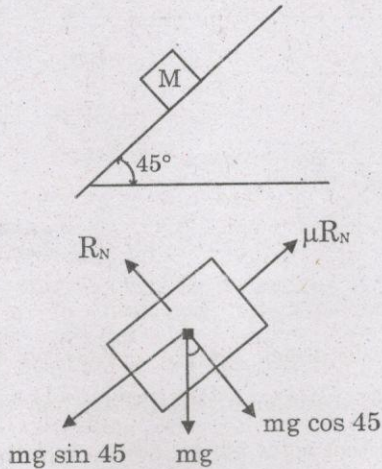

1. 56 to 59
2. 66 to 69
3. 76 to 79
4. 86 to 89

57. Geometrical method of addition of two vector is called

1. triangular method
2. parallelogram method
3. both
4. none of the above

58. Which of the following concepts is independent of acceleration due to gravity?

1. Surface tension
2. Viscosity
3. Archimede's principle
4. Both 1 and 2

59. If there is no change in momentum of a body then impulse of a force is

1. Zero
2. Infinite
3. Constant
4. None of the above

60. For the four-bar linkage shown in the figure, the angular velocity of link AB is 1 rad/s. the length of link CD is 1.5 times the length of link AB. In the configuration shown, the angular velocity of link CD in rad/s is
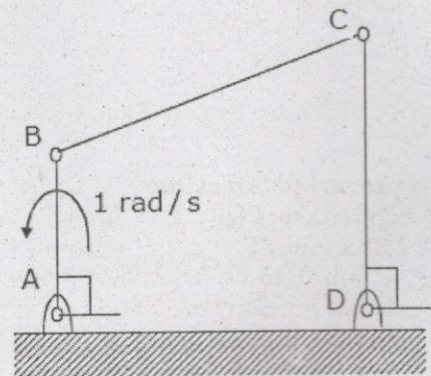
1. 3
2. 3/2
3. 1
4. 2/3

61. A mass of 1 kg is attached to two identical springs each with stiffness k = 20 kN/m as shown in the figure. Under frictionless condition, the natural frequency of the system in Hz is close to
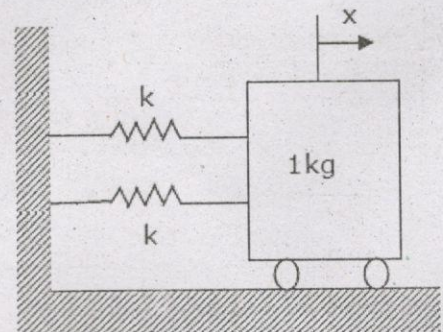

1. 32
2. 23
3. 16
4. 11

62. A link OB is rotating with a constant angular velocity of 2 rad/s in counter clockwise direction and a block is sliding radially outward on it with an uniform velocity of 0.75 m/s with respect to the rod, as shown in the figure below. If OA = 1 m, the magnitude of the absolute acceleration of the block at location A in 2 m/ s is
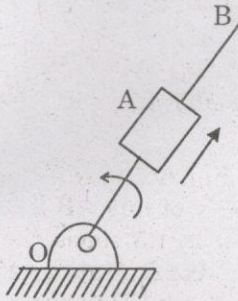
1. 3
2. 4
3. 5
4. 6

63. A planar closed kinematic chain is formed with rigid links PQ = 2.0 m, QR = 3.0 m, RS = 2.5 m and SP = 2.7 m with all revolute joints. The link to be fixed to obtain a double rocker (rocker-rocker) mechanism is
1. PQ
2. QR
3. RS
4. SP

64. A triangular–shaped cantilever beam of uniform–thickness is shown in the figure. The Young's modulus of the material of the beam is E. A concentrated load P is applied at the free end of the beam. The width of the beam is b. The maximum deflection of the beam is
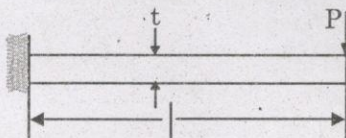

1. $\dfrac{24Pl^3}{Ebt^3}$

2. $\dfrac{12Pl^3}{Ebt^3}$

3. $\dfrac{8Pl^3}{Ebt^3}$

4. $\dfrac{6Pl^3}{Ebt^3}$

65. A thin cylinder of inner radius 500 mm and thickness 10 mm is subjected to an internal pressure of 5 MPa. The average circumferential (hoop) stress in MPa is
1. 100
2. 250
3. 500
4. 1000

66. A simply supported beam PQ is loaded by a moment of 1 kN-m at the mid-span of the beam as shown in the figure. The reaction forces RP and RQ at supports P and Q respectively are
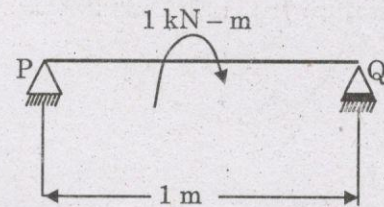
1. 1 kN downward, 1 kN upward
2. 0.5 kN upward, 0.5 kN downward
3. 0.5 kN downward, 0.5 kN upward
4. 1 kN upward, 1 kN upward

67. A rod of length L having uniform cross-sectional area A is subjected to a tensile force P as shown in the figure below. If the Young's modulus of the material varies linearly from E1 to E2 along the length of the rod, the normal stress developed at the section-SS is
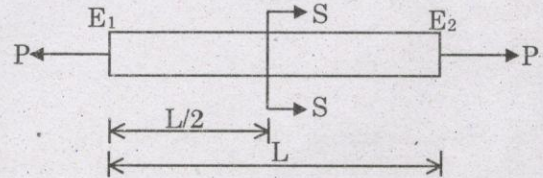
1. $\dfrac{P}{A}$

2. $\dfrac{P(E_1 - E_2)}{A(E_1 + E_2)}$

3. $\dfrac{PE_2}{AE_1}$

4. $\dfrac{PE_1}{AE_2}$

68. Consider a simply supported beam of length, 50 h, with a rectangular cross-section of depth, h, and width, 2 h. The beam carries a vertical point load, P, at its mid-point. The ratio of the maximum shear stress to the maximum bending stress in the beam is
1. 0.02
2. 0.10
3. 0.05
4. 0.01

69. A compound gear train with gears P, Q, R and S has number of teeth 20, 40, 15 and 20, respectively. Gears Q and R are mounted on the same shaft as shown in the figure below. The diameter of the gear Q is twice that of the gear R. If the module of the gear R is 2 mm, the center distance in mm between gears P and S is
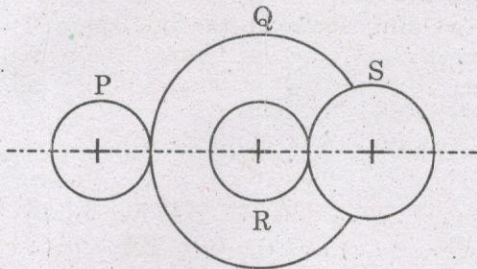
1. 40
2. 80
3. 120
4. 160

70. A bar is subjected to fluctuating tensile load from 20 kN to 100 kN. The material has yield strength of 240 MPa and endurance limit in reversed bending is 160 MPa. According to the soderberg principle, the area of cross-section in mm² of the bar for a factor of safety of 2 is
1. 400
2. 600
3. 750
4. 1000

71. A drum brake is shown in the figure. The drum is rotating in anticlockwise direction. The coefficient of friction between drum and shoe is 0.2. The dimensions shown in the figure are in mm. The braking torque (in N.m) for the brake shoe is
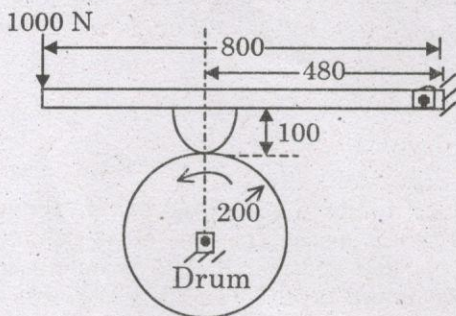
1. 63 to 65
2. 73 to 75
3. 83 to 85
4. 93 to 95

72. Bending moment M and torque is applied on a solid circular shaft. If the maximum bending stress equals to maximum shear stress developed, then M is equal to
1. T/2
2. T
3. 2T
4. 4T

73. In the following geometric modelling techniques which are not three-dimensional modelling?
1. Wireframe modelling
2. Drafting
3. Surface modelling
4. Solid modelling

74. Cellular manufacturing system is designed on the basis of :
1. JIT
2. MRP
3. CRP
4. GT

75. The components of FMS system are:
1. Manufacturing system
2. Material handling system
3. Tool handling system
4. All of the above

76. A phase transformation in which all the liquid phase transforms on cooling to two solid phases simultaneously is called
1. Eutectic
2. Hyper Eutectic
3. Hypo-Eutectic
4. None of these

77. Line A_{cm} on Iron-Iron–carbide diagram indicates
1. the beginning of transition from austenite to ferrite
2. completion of austenite transition to ferrite and pearlite
3. limit of carbon solubility in austenite
4. all of these

78. Which one of the following phase is produced by isothermal quenching?
1. Ferrite
2. Pearlite
3. Martensite
4. Bainite

79. Addition of silicon to cast iron
(a) promotes graphite nodule formation
(b) promotes graphite flake formation
(c) increases the fluidity of the molten metal
(d) improves ductility

Which of these statements is correct?
1. (a) and (d)
2. (b) and (c)
3. (a) and (c)
4. (c) and (d)

80. Brass is an alloy of copper and
1. lead
2. zinc
3. tin
4. antimony

81. Cermets are
1. metals for high temperature use with ceramic like properties
2. ceramics with metallic strength and lusture
3. coated tool materials
4. metal –ceramic composites

82. Directional solidification in castings can be improved by using
1. chills and chaplets
2. chills and padding
3. chaplets and padding
4. chills, chaplets and padding

83. The increase in hardness due to cold working is called
1. cold hardening
2. hot hardening
3. work hardening
4. age hardening

84. In four high rolling mill the bigger rollers are called
1. guide roll
2. back up roll
3. main roll
4. support roll

85. In straight polarity welding
1. electrode holder is connected to the negative and work to the positive
2. electrode holder is connected to the positive and work to the negative
3. work is positive and holder is earthed
4. holder is positive and work is earthed

86. The phenomenon of weld decay occurs in
1. cast iron
2. brass
3. stainless steel
4. bronze

87. Welding spatter refers to
1. welding electrode
2. flux
3. filler material
4. welding defect

88. In a machining process, the percentage of heat carried away by the chips is typically
1. 5%
2. 25%
3. 50%
4. 75%

89. In a lathe tumbler gears are used to
1. reduce the spindle speed
2. transmit power from the lead screw to the carriages
3. reverse the direction of the spindle rotation
4. reverse the direction of rotation of the driven gear

90. Helical grooves are provided on the twist drill
1. to reduce the bulk
2. for guiding the tip
3. to increase the length of the cutting edge
4. to facilitate removal of chip

91. A milling machine which has a table that can be swiveled and set at any angle to the work piece is called
1. bed milling machine
2. drum milling machine
3. universal milling machine
4. straddle milling machine

92. Tolerances are specified
1. to obtain the desired fits
2. because it is not possible to manufacture a size exactly
3. to obtain high accuracy
4. to have proper allowance

93. Gear tooth vernier is used to measure
    1. circular pitch
    2. depth of tooth
    3. addendum and dedendum
    4. pitch line thickness of the tooth

94. Which of the following thermocouples can measure temperature in a comparatively high range?
    1. iron-constantan
    2. chromel-alumel
    3. platinum-rhodium
    4. iridium-rhodium

95. Which of the following is not suitable for measuring the flow of a non conducting fluid?
    1. orifice plate
    2. rotameter
    3. electromagnetic flow meter
    4. pitot-static tube reverse

96. The use of Lumped analysis is justified when Biot number (Bi)
    1. >1
    2. $5 < Bi < 10$
    3. < 0.1
    4. $10 < Bi < 50$

97. A radiation shield should have
    1. high emissivity
    2. low reflectivity
    3. high reflectivity
    4. none of the above

98. In a convective heat transfer situation, when the Prandtl number is one
    1. Thermal boundary layer does not exist
    2. Viscous boundary layer thickness equals the thermal boundary layer thickness
    3. Viscous boundary layer thickness is less than the thermal boundary layer thickness
    4. Viscous boundary layer thickness is greater than the thermal boundary layer thickness

99. During the condensation over a vertical plate, the flow becomes turbulent when
    1. Re > 1800
    2. Re > 2000
    3. Re > 2800
    4. Re > 3000

100. The temperature distribution for a plane wall, for steady state heat flow and constant value of thermal conductivity, is
    1. Logarithmic
    2. Parabolic
    3. Linear
    4. Any of the above

101. Sherwood number used in mass transfer is analogous to which dimensionless number used in Heat transfer
    1. Biot number
    2. Prandtl number
    3. Peclet number
    4. Nusselt number

102. At 100 % RH, wet bulb temperature is
    1. More than dew point
    2. Less than dew point
    3. Same as dew point
    4. Has no relation with dew point

103. One ton of refrigeration is equivalent to
    1. 500 k cal/min
    2. 3.5 kW
    3. 10 hp
    4. 350 W

104. The capillary tube used as expansion device in VCR system works on the principles of
    1. Isothermal expansion causing pressure drop
    2. Adiabatic expansion causing pressure drop
    3. Throttle expansion causing pressure drop
    4. Flow through pipe with friction causing pressure drop

105. A refrigerator and heat pump operates in the same temperature limits. If COP of refrigerator is 4 then COP of heat pump is
    1. 3
    2. 4
    3. 5
    4. 6

106. Select the Kelvin Planck statement of second law
    1. an engine cannot produce more heat than the heat it receives
    2. a refrigerator cannot transfer heat from a low temperature reservoir to high temperature reservoir without work
    3. an engine cannot produce work without discharging heat
    4. an engine discharges heat if work is less than heat it receives

107. The state of an ideal gas is changed isothermally from position 1 to position 2 is shown above. What is the change in the internal energy of the gas during this process?
    1. $\Delta U = W$
    2. $\Delta U = Q$
    3. $\Delta U > 0$
    4. $\Delta U = 0$

108. The change of entropy when the heat is absorbed by the gas is
    1. positive
    2. negative
    3. positive or negative
    4. none of the above

109. Unit of thermal diffusivity is
    1. m²/hr
    2. m²/hr °C
    3. kcal/m² hr
    4. kcal/m. hr °C

110. Effectiveness in case of counter flow heat exchanger as compared to parallel flow heat exchanger is
    1. Higher
    2. Lower
    3. Same
    4. Depends on the area of heat exchanger

111. The product of Grashoff number and Prandtl number is known as
    1. Stanton number
    2. Biot number
    3. Rayleigh number
    4. None of the above

112. In aqua-ammonia and Lithium-bromide water absorption refrigeration systems, the refrigerants are respectively
    1. water and water
    2. ammonia and water
    3. ammonia and lithium bromide
    4. water and lithium bromide

113. Gibbs function of ideal gas depends on
    1. Temperature and specific volume
    2. Temperature and pressure
    3. Pressure and specific volume
    4. Pressure and density

114. The efficiency of a Carnot engine is 0.75. It cycle direction is reversed, COP of reversed Carnot cycle will be
    1. 0.25
    2. 0.5
    3. 1.25
    4. 1.33

115. Consider an ideal heat pump and a perfect electric heater. The electric heater converts 100% of the electrical energy into heat energy; the heat pump converts 100% of the electrical energy into work, which then powers a Carnot refrigerator. Which is the more "efficient" way to heat a home? (Ignore maintenance or start-up costs.)
    1. The electric heater is always more efficient
    2. The heat pump is always more efficient
    3. The heat pump is more efficient if the outside temperature is not too cold
    4. The heat pump is more efficient if the outside temperature is too cold