

2012

PART 05 – MECHANICAL, AUTOMOBILE AND AERONAUTICAL ENGINEERING

(Answer ALL questions)

76. In rigid body mechanics, equilibrium should satisfy with respect to

- 1) Only forces
- 2) Both forces and moments
- 3) Energy
- 4) Geometry

77. Newton's II law deals with the

- 1) Equilibrium of the body moving with acceleration or deceleration
- 2) Equilibrium of the body moving with constant velocity
- 3) Static equilibrium
- 4) Balance of energy

78. Friction between two surfaces in contact depends on

- 1) Bending moment
- 2) Area of contact between the surfaces
- 3) Energy possessed by the surfaces
- 4) Equal and opposite normal reaction between surfaces

79. If the roots of equation $[(d^2x/dt^2) + ((c/m)) \times (dx/dt) + ((s/m) \times x) = 0]$ of motion for a vibrating system with viscous damping are real, then the system will be

- 1) Forced vibration
- 2) Under damped
- 3) Critically damped
- 4) Over damped

80. A rivet is connecting two plates through a lap joint subjected to a tensile force 5KN . If the maximum permissible shear stress in rivet is 62.5Mpa, the area of cross-section of rivet is

- 1) 125 mm²
- 2) 100 mm²
- 3) 80 mm²
- 4) 40 mm²

81. A steam boiler of 1.5m internal diameter is subjected to an internal pressure of 2 N/mm².

If the efficiency of the longitudinal rivet joint is 80% and maximum tensile stress in plate section is not to exceed 125 N/mm² the thickness of the plate will be

- 1) 6 mm
- 2) 12 mm
- 3) 15 mm
- 4) 20 mm

82. A beam 10 m long hinged at both the ends is subjected to a clockwise moment of 40 kN – m at a distance of 3 m from one end. Shear force at the centre of beam is

- 1) 0 KN
- 2) 2 KN
- 3) 4 KN
- 4) 6 KN

83. A close coil helical spring absorbs 40 N – mm of energy while extending by 4 mm, the stiffness of the spring is

- 1) 10 N/mm
- 2) 8 N/mm
- 3) 5 N/mm
- 4) 4 N/mm

84. Which one of the following iron exist between 910°C and 1403°C?

- 1) Alpha -iron
- 2) Beta-iron
- 3) Gamma-iron
- 4) Delta-iron

85. The process used for relieving the internal stresses previously set up in the metal and for increasing the malleability of steel is

- 1) Normalising
- 2) Full annealing
- 3) Process annealing
- 4) Spheroidising

86. The alloying element which increases residual magnetism and coercive magnetic force in steel for magnet is

- 1) Chromium
- 2) Nickel
- 3) Vanadium
- 4) Cobalt

87. The defect which takes place due to imperfect packing of atoms during crystallisation is known as

- 1) Line defect
- 2) Surface defect
- 3) Core defect
- 4) Point defect

- 88. While computing the stoichiometric air requirement for combustion of fuels, the air is assumed to comprise**
- 1) O_2 and N_2 alone
 - 2) O_2 , N_2 , Ar and CO_2
 - 3) O_2 alone
 - 4) None of the above
- 89. Among the four thermodynamic processes being followed in Rankine cycle and Brayton cycle,**
- 1) Two thermodynamic processes are similar while two are dissimilar
 - 2) Three thermodynamic processes are similar while one is different
 - 3) All four thermodynamic processes are similar
 - 4) All four thermodynamic processes are dissimilar
- 90. Which one of the following process is the energy efficient one for compression of air**
- 1) Isentropic compression
 - 2) Polytropic compression
 - 3) Isothermal compression
 - 4) None of the above
- 91. Which one of the following increases COP of a refrigeration cycle?**
- 1) Sub cooling
 - 2) Superheating
 - 3) Reducing the evaporator temperature
 - 4) Increasing the condenser temperature
- 92. Thermal diffusivity is**
- 1) A dimensionless parameter
 - 2) A function of temperature
 - 3) A function of distance
 - 4) A physical property of the material
- 93. Laminar flow occurs in pipes when Reynolds number**
- 1) Less than 10^5
 - 2) Lies between 3000 - 4000
 - 3) More than 2000
 - 4) Less than 2000
- 94. The radiation emitted by the sun in wavelength between $\lambda = 0.4$ and $\lambda = 0.7\mu m$ is called**
- 1) Thermal Radiation
 - 2) Solar Radiation
 - 3) Visible Radiation
 - 4) Infrared Radiation
- 95. A heat exchanger is referred to as a compact heat exchanger when the surface area density is**
- 1) Greater than about $400 m^2/m^3$
 - 2) Greater than about $700 m^2/m^3$
 - 3) Greater than about $1400 m^2/m^3$
 - 4) Greater than about $1700 m^2/m^3$
- 96. The continuity equation is connected with**
- 1) Viscous/unviscous fluids
 - 2) Compressibility of the fluid
 - 3) Conservation of mass
 - 4) Steady/unsteady flow
- 97. Arrange the following materials in decreasing order of hardness**
- a) Tungsten carbide
 - b) Boron carbide
 - c) Diamond
 - d) Titanium carbide
1. a-b-d-c
 2. d-a-b-c
 3. c-b-d-a
 4. c-b-a-d
- 98. Which one of the following is not associated with lathe?**
- a) Compound rest
 - b) Dog
 - c) Tennon
 - d) Horn
- 1) (b) and (c)
 - 2) (a) and (d)
 - 3) (c) and (d)
 - 4) (b) and (d)
- 99. The main constituents of soldering alloy are**
- 1) tin and lead
 - 2) tin and copper
 - 3) tin, copper and lead
 - 4) tin, lead and magnesium
- 100. The G code used for dwell is**
- 1) G03
 - 2) G04
 - 3) G05
 - 4) G08
- 101. In loop scavenging, the top of the piston is**
- 1) flat
 - 2) contoured
 - 3) slanted
 - 4) depressed
- 102. Cetane number is determined by comparing**

the performance of diesel oil with the following hydrocarbons

- 1) mixture of cetane and alphas-methyl naphthalene
- 2) ethylene dibromide
- 3) mixture of aldehydes and ketones
- 4) mixture of cetane with tetra-ethyl Lead

103. Piston rings are plated with chromium, cadmium or phosphate in order to

- 1) improve surface finish
- 2) prevent clogging
- 3) reduce wear and eliminate scuffing
- 4) improve heat transfer

104. Ignition timing of a multi cylinder petrol engine can be adjusted by

- 1) rotating the crank
- 2) adjusting the spark plug gap
- 3) adjusting ignition coil position
- 4) rotating the distributor

105. For spark ignition engines, fuels in the order of decreasing knock tendency are

- 1) paraffins, naphthenes, aromatics
- 2) naphthenes, paraffins, aromatics
- 3) paraffins, aromatics, naphthenes
- 4) aromatics, paraffins, naphthenes

106. The transmission efficiency values for motor cars and trucks and buses are about

- 1) 0.80 – 0.82; 0.84 – 0.86
- 2) 0.84 – 0.86; 0.86 – 0.88
- 3) 0.90 – 0.92; 0.82 – 0.85
- 4) 0.94 – 0.96; 0.86 – 0.89

107. In four wheel drive transmission, the additional mechanism used apart from regular gear box is

- 1) Fifth wheel case transmission gear
- 2) Transfer case containing gear drive
- 3) Transfer transmission gear drive
- 4) Fifth transmission gear drive

108. The combustion in a diesel engine is

- 1) Homogeneous combustion
- 2) Heterogeneous combustion
- 3) Homogeneous and Heterogeneous combustion
- 4) Non-Homogeneous and Non-Heterogeneous combustion

109. The nitric oxide formation takes place at

- 1) High flame heat condition
- 2) High flame temperature condition
- 3) High flame pressure condition
- 4) High flame enthalpy condition

110. The catalytic converter used in passenger cars are

- 1) One way catalytic converter
- 2) Two way catalytic converter
- 3) Three way catalytic converter
- 4) Four way catalytic converter

111. Thin airfoil theory predicts the lift curve slope of a thin airfoil as

- 1) π per degree
- 2) π per radian
- 3) 2π per degree
- 4) 2π per radian

112. NACA 0014 implies that the airfoil is

- 1) symmetric
- 2) positively cambered
- 3) negatively cambered
- 4) cusped

113. The component of a transonic airplane for which transonic area rule applied is

- 1) nose
- 2) wing
- 3) tail
- 4) fuselage

114. Induced drag of an airplane can be reduced by

- 1) boundary layer fence
- 2) spoilers
- 3) winglets
- 4) decreasing aspect ratio

115. V-n diagram is a plot of

- 1) velocity Vs normal force
- 2) volumetric flow Vs normal force
- 3) velocity Vs load factor
- 4) volumetric flow Vs load factor

116. The approximate loss of total pressure across a scramjet engine is

- 1) 0.5%
- 2) 5%
- 3) 50%
- 4) 1.8%

117. The ratio of enthalpy rise across the rotor to the enthalpy rise across the stage of an axial flow compressor is known as

- 1) compression efficiency
- 2) degree of reaction
- 3) stage efficiency
- 4) loading coefficient

118. A turbojet powered aircraft is suitable for

- 1) low speed and heavy load applications

- 2) high speed and heavy load applications
- 3) high speed and high altitude applications
- 4) low speed and high altitude applications

119. Wall heat flux of a rocket nozzle is maximum near

- 1) the throat
- 2) the inlet
- 3) the exit
- 4) at 2/3 of the distance between throat and exit

120. In neutral burning of solid rocket motors the

- 1) propellant grain length remains constant
- 2) thrust developed by the rocket remains constant
- 3) mass flow rate increases with operational time
- 4) combustion chamber pressure increases with operational time

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