

PART-I

1. Which of the following statements is true with respect to the sensible cooling of air?
 - a. It is a process in which only the sensible heat of the air is removed and there is no change in the moisture content.
 - b. It is one of the most common psychrometric processes.
 - c. There is overall reduction in the enthalpy of the air.
 - d. All the above
2. Which of the following effects the laminar-turbulent transition?
 - a. The transition happens when the viscosity of the fluid is decreased.
 - b. The transition happens when the density of the fluid is increased.
 - c. Both a and b
 - d. None of these
3. What is a perfect black body?
 - a. It is an idealized physical body that absorbs all incident electromagnetic radiation, regardless of frequency or angle of incidence.
 - b. It is an idealized physical body that absorbs all incident ultra violet radiation, regardless of angle of incidence.
 - c. It is an idealized physical body that absorbs all incident gamma ray radiation, where the angle of incidence is 90° .
 - d. None of these
4. Which law of thermodynamics defines the concept of thermodynamic entropy?
 - a. Zeroth law
 - b. First law
 - c. Second law
 - d. Third law
5. Which of the following is true with reference to bypass factor?
 - a. Bypass factor decreases as contact factor increases
 - b. Bypass factor is independent of contact factor
 - c. Bypass factor decreases as contact factor decreases
 - d. Bypass factor is the log of contact factor
6. Which of the following has the lowest Prandtl number?
 - a. Air
 - b. Hydrogen
 - c. Water
 - d. Mercury
7. What is the sensible heat factor if H_s =sensible heat gain=36kJ/s and H_L =Latent Heat Gain = 24
 - a. 0.15
 - b. 1.50
 - c. 0.6
 - d. None of these
8. The system where a gas turbine is used to generate electricity, hot water and air conditioning, it is called
 - a. Aqua-thermal regeneration
 - b. Cogeneration or Trigeneration
 - c. Thermo-electric conditioning
 - d. None of these
9. Which of the following effects the thermal diffusivity of material?
 - a. Specific heat capacity of the material
 - b. External temperature
 - c. Pressure
 - d. All the above

10. Which of the following metals has the highest thermal diffusivity?
 - a. Aluminum
 - b. Copper
 - c. Gold
 - d. Silver
11. What is a sprue?
 - a. It is the cavity created to facilitate quick cooling of liquid material in a mould
 - b. It is the cavity created inside the mould for smooth flow of liquid metal
 - c. It is the passage through which liquid material is introduced into a mould
 - d. None of these
12. Which of the following operations can be carried out on a lathe?
 - a. Cutting
 - b. Sanding
 - c. Knurling
 - d. All the above
13. Which of the following needs to be considered in calculating contraction allowances?
 - a. Type of alloy being cast
 - b. Size of the sprue
 - c. Time spent on removing the cast
 - d. All the above
14. While casting, which of the following shrinkages need to be taken considered?
 - a. Liquid shrinkage
 - b. Solid shrinkage
 - c. Both a and b
 - d. None of the above
15. Which of the following types of flames are desirable while welding?
 - a. Oxidizing flame
 - b. Reducing Flame
 - c. Neutral flame
 - d. Both a and b
16. Which of the following is true with respect to chlorofluorocarbons? (CFCs), but also include newer refrigerants which typically include fluorine instead of chlorine and do not deplete the ozone layer.
 - a. They are implicated in ozone depletion.
 - b. They are used as refrigerants as well as aerosol propellants.
 - c. Many of them are banned or severely restricted by the Montreal Protocol.
 - d. All the above
17. What is the unit for measurement of enthalpy?
 - a. kJ
 - b. Kj/kg
 - c. Kg/kJ
 - d. None of the above
18. What is an an adiabatic process?
 - a. It is a process where there is no transfer of heat but matter is transferred between a system and its surroundings.
 - b. It is a process where there is a transfer of both matter and heat between a system and its surroundings.
 - c. It is a process where there is no transfer of heat or matter between a system and its surroundings.
 - d. None of these
19. Which of the following use Brayton Cycle?
 - a. Gas turbine engines
 - b. Airbreathing jet engines
 - c. Both a and b
 - d. None of the above

20. Which of the following is true with respect to upset forging?
- Upset forging increases the diameter of the work-piece by increasing its length.
 - Upset forging increases the diameter of the work-piece by compressing its length.
 - Upset forging increases the diameter of the work-piece by melting and recasting it.
 - None of the above
21. Which of the following statements is correct?
- In a concurrent force system, all forces lie on the same line.
 - In a concurrent force system, all forces equal but work in opposite direction.
 - In a concurrent force system, all forces pass through a common point.
 - None of these
22. Which of the following is the point in a body around which the resultant torque due to gravity forces vanishes?
- Center of gravity
 - Center of vanity
 - Center of torquelessness
 - Spherical center
23. Consider a semicircle with a radius r . Where exactly does its center of gravity lie?
- At a distance of $2r/3\pi$ on its vertical radius measured from the base.
 - At a distance of $4r/3\pi$ on its vertical radius measured from the base.
 - At a distance of $4r/6\pi$ on its vertical radius measured from the base.
 - At a distance of $8r/9\pi$ on its vertical radius measured from the base.
24. Which of the following is true with respect to coplanar forces?
- Coplanar force systems can be concurrent and parallel.
 - Coplanar force systems can be non-concurrent and non-parallel.
 - Coplanar force systems have all the forces acting in in one plane.
 - All the above
25. If AMA is the actual mechanical advantage and IMA is the ideal mechanical advantage of a machine, then the efficiency (E) is given by
- $E = \text{IMA}/\text{AMA}$
 - $E = (\text{IMA}) \cdot (\text{AMA})$
 - $E = \text{AMA}/\text{IMA}$
 - None of the above
26. A body with mass 900 kg is located on a 15 degrees inclined plane. What is the pulling force without friction?
- 2285 N
 - 1703 N
 - 900 N
 - None of these
27. What is the SI unit of measurement of angular velocity?
- Meters per second
 - Radians per second
 - Ln of Radiance per hour
 - Km per hour
28. The efficiency of a machine is always between
- 0 and infinity
 - 1 and +1
 - 0 and 1
 - Minus infinity to plus infinity

29. Which of the following methods can be used to fasten a gusset plate to a permanent member?
a. Using bolts b. Using rivets c. Both a and b d. None of these
30. Which of the following is a measure of a circular beam's ability to resist torsion?
a. Polar moment of inertia b. Moment of inertia
c. Angular acceleration d. None of these
31. Which of the following is true for a simply supported beam with a central load?
a. The bending moment is at the supports
b. The bending moment at the center is minimum
c. The bending moment at the center is maximum
d. None of these
32. Which of the following describes caulking?
a. Caulking is the process used to make riveted iron or steel ships and boilers watertight or steam-tight.
b. Caulking is the process used to make iron or steel ships and boilers rust-proof.
c. Caulking is the process used to make iron or steel ships reduce the resistance while moving in water.
d. Caulking is the process used to make riveted iron or steel ships to reduce the listing while navigating rough seas.
33. Energy stored in a body when strained within elastic limits is called _____.
a. Elastic energy b. Strain energy c. Both a and b d. None of these
34. Which of the following is true with Euler's formula for columns?
a. It helps us calculate the critical load for a long, slender and ideal column.
b. It helps us calculate the slenderness ratio for a long, slender and ideal column.
c. It helps us calculate the age at which a long, slender and ideal column is likely to buckle.
d. It helps us calculate the probability distribution of the load for a long, slender and ideal column.
35. What is the SI unit for shear stress?
a. Jhoule b. Pascal c. Newton d. Pascal/ S²
36. Which of the following is true in an isothermal process?
a. There is no change of a system, but there is a change in the temperature.
b. There is a change of a system, leading a corresponding change in the temperature.
c. There is a change of a system, in which the temperature remains constant.
d. None of these
37. Which of the following is true with respect to Kelvin-Planck statement?
a. It implies that it is impossible to build a heat engine that has 100% thermal efficiency.
b. It implies that there exists a theoretical heat engine that has a thermal efficiency of more than 100%.
c. It implies that each and every heat engine will invariably have a 100% thermal efficiency.
d. None of these

38. What is the gas constant (R)?
 a. It is work per degree per mole
 b. It is work per mole
 c. It is work measured as Joule
 d. It is change in temperature per mole
39. Which of the following is the correct statement of Boyle's law? (P= pressure, V= volume and T = temperature)
 a. $PV = 0$ when T is constant
 b. $PV = k$ when T is constant
 c. $PV = T$
 d. $PVT = 0$
40. What is isochoric process?
 a. It is a constant volume process
 b. It is a constant pressure process
 c. It is a constant temperature process
 d. It is a process where volume, pressure and temperature remain constant through out
41. One of the 4 laws of thermodynamics states "If two systems are in thermal equilibrium respectively with a third system, they must be in thermal equilibrium with each other". Which law is it?
 a. Zeroth law of thermodynamics
 b. First law of thermodynamics
 c. Second law of thermodynamics
 d. Third law of thermodynamics
42. Which is the class of lever where Resistance or load is in the middle?
 a. Class 1
 b. Class 2
 c. Class 3
 d. All the above
43. Which of the following is true with bevel gears?
 a. They are gears where the axes of the two shafts intersect.
 b. The tooth-bearing faces of the gears themselves are conically shaped.
 c. They are most often mounted on shafts that are 90 degrees apart.
 d. All the above
44. What is the function of a cam?
 a. It transforms rotary motion into linear motion
 b. It transforms linear motion into rotary motion
 c. Both a and b
 d. None of these
45. In which of the following cams does the follower move in a plane perpendicular to the axis of rotation of the camshaft?
 a. Radial or plate cam
 b. Cylindrical cam
 c. Both a and b
 d. None of these
46. Which of the following belts is used to continuously carry a load between two points.
 a. Conveyer belt
 b. Timing belt
 c. Both a and b
 d. None of the above
47. Which of the following simple machines converts rotational motion to linear motion, and a torque (rotational force) to a linear force?
 a. Lever
 b. Screw
 c. Belt
 d. All the above

48. Which of the following examples belongs to type 3 lever?
a. Scissors b. Wheel barrow c. Nutcracker d. Human mandible
49. Which of the following does not have piston strokes?
a. Two stroke engine b. Wankel engine c. Both a and b d. None of these
50. Which of the following cycles is also known as constant volume cycle?
a. Carnot cycle b. Otto cycle c. Both a and b d. None of these
51. What is the name by which the following theorem "No engine operating between two heat reservoirs can be more efficient than a Carnot engine operating between those same reservoirs" is known?
a. Carnot's theorem b. Otto cycle theorem
c. Theorem of energy conservation d. None of these
52. What is the name of the process used to reduce the hardness of steel using heat treatment?
a. Smelting b. Tempering c. Cold rolling d. None of these
53. Which of the following will increase the efficiency of an Otto cycle?
a. Increasing the compression ratio b. Decreasing the compression ratio
c. Decreasing the pressure d. None of these
54. Which of the following is true with heat engines?
a. They transform magnetic energy into heat energy.
b. They transform thermal energy into magnetic energy.
c. They transform mechanical energy into heat energy.
d. They transform thermal energy into mechanical energy.
55. Which of the following defines petrol with an octane rating of 90?
a. Petrol with the same knocking characteristics as a mixture of 90% iso-octane and 10% heptane.
b. Petrol with the same knocking characteristics as a mixture of 10% iso-octane and 90% heptane.
c. Petrol with the same knocking characteristics as a mixture of 45% iso-octane and 45% heptane.
d. None of these.
56. As compared to Watt governor, Porter Governor has
a. Less sleeve weight b. Larger centrifugal force
c. Lower centrifugal force d. Same centrifugal force
57. When is a governor said to be isochronous?
a. When the governor is in equilibrium in all possible configurations at the equilibrium same speed.
b. When the governor is in equilibrium at a specific speed where the fuel efficiency is maximum.
c. When the speed of the engine fluctuates continuously above and below the mean speed.
d. None of these

58. When the speed of the engine fluctuates continuously above and below the mean speed, then the governor is said to be
 a. Stable b. Hunt c. Ground d. Damped
59. Which of the following is a cause for vibrations in an engine?
 a. Imbalances in the rotating parts b. Uneven friction
 c. Meshing of gear teeth d. All the above
60. What is the effect of temperature on thermal conductivity of solid metals?
 a. Their thermal conductivity increases with increase in temperature.
 b. Their thermal conductivity decreases with increase in temperature.
 c. Their thermal conductivity is independent of changes in temperature.
 d. The effect of temperature on their thermal conductivity depends on the atmospheric pressure.
61. What are the constituent elements in brass?
 a. Copper and aluminum b. Copper and zinc
 c. Copper and arsenic d. Copper and silicon
62. Which of the following are thermoplastic polymers?
 a. Acrylonitrile butadiene styrene b. Polyethylene
 c. Polyvinyl chloride d. All the above
63. In addition to Austenite, which other elements are used in the manufacture of 300 Series austenitic stainless steel?
 a. Aluminum and copper b. Aluminum and nickel
 c. Chromium and nickel d. None of these
64. What is a sclerometer?
 a. It is an instrument used to measure sclerosis.
 b. It is an instrument used to measure scratch hardness of materials.
 c. It is an instrument used to measure cavities formed during casting.
 d. It is an instrument used to measure light reflecting properties of non-metals.
65. Which of the following is an allotrope of carbon?
 a. Diamond b. Graphite c. Fullerene d. All the above
66. Graphite is an example of _____.
 a. Hexagonal crystal system b. Monoclinic crystal system
 c. Orthorhombic crystal system d. None of these
67. What is smelting?
 a. It is a process where water is used to remove the impurities in the ore.
 b. It is a process where the ore is powdered and concentrated in a centrifuge.
 c. It is a process where heat and a chemical reducing agent are used to decompose the ore.
 d. None of these

68. What is the SI unit of measurement of resilience?
- a. Joule per cubic meter
 - b. Joule per meter
 - c. Joule per kilogram
 - d. Joule per second
69. Which of the following statements is true?
- a. Normalized steel has a lower strength than annealed steel.
 - b. Normalized steel has a higher strength than annealed steel.
 - c. Normalized steel has a same strength as annealed steel.
 - d. Normalized steel has a high degree of softness.
70. In which of the following can dye penetrant inspection is used?
- a. To locate surface-breaking defects in all non-porous materials.
 - b. To locate surface-breaking defects in all porous materials.
 - c. To locate internal cavity defects in all porous materials.
 - d. None of these

Part II

Section – A: Mechanical

71. Cemented carbides are an example of composed of a metal matrix composite
- a. Metal alloys
 - b. Metal matrix composite
 - c. Rare earth metals
 - d. None of these
72. A cylindrical grinder can be used for _____.
- a. Outside diameter grinding
 - b. Inside diameter grinding
 - c. Both a and b
 - d. None of these
73. Which of the following is true with respect to titanium alloys?
- a. They have very high tensile strength.
 - b. They are light in weight, have extraordinary corrosion resistance.
 - c. They have the ability to withstand extreme temperatures.
 - d. All the above
74. Which of the following processes is used by lensmakers to produce surfaces that are flat to better than 30 nanometers?
- a. Lapping
 - b. Casting
 - c. Forming
 - d. None of these
75. Which of the following is used in Ultrasonic machining, or ultrasonic impact grinding?
- a. Abrasive slurry
 - b. A tool oscillating at ultrasonic frequencies
 - c. Both a and b
 - d. None of these
76. What is the name of the process where a permanent mold is rotated continuously about its axis at high speeds as the molten metal is poured into it?
- a. Round robin casting
 - b. Circular axis casting
 - c. Rotocasting or Centrifugal casting
 - d. None of these

77. Recrystallization process is generally used when _____.
 a. Softening of metals previously hardened by cold work is required
 b. Hardening of metals previously softened by ductile work is required
 c. Both a and b
 d. None of these
78. What are extrudates?
 a. These are products external to the items being cast.
 b. These are items produced through extrusion.
 c. These are items having external cavities.
 d. All the above
79. Which of the following can be extracted from its ore through smelting process?
 a. Silver b. Iron c. Copper d. All the above
80. What is mesomorphous state?
 a. It is a state where the same element exists in different forms at the same temperature and pressure.
 b. It is same as amorphous state.
 c. It is a state between the true crystalline state and the completely irregular amorphous state.
 d. None of these
81. An object sitting on a sloped surface is prevented from sliding down by _____.
 a. Kinetic friction b. Static friction c. Fluid friction d. None of these
82. Which of the following is true with respect to the coefficient of friction?
 a. It is the ratio of the force of friction between two bodies and the force pressing them together.
 b. It is a dimensionless scalar value.
 c. It depends on the materials used.
 d. All the above
83. What is the SI unit for angular acceleration?
 a. Meters per second b. Radiance per meter
 c. Radiance per second² d. Degrees per second
84. The ratio of the output force to the input force is known as
 a. Force augmentation b. Mechanical advantage
 c. Strength ratio d. None of these
85. A torsion pendulum uses _____.
 a. Gravitational force b. Force of the twisting torsion spring
 c. Force of a magnetic field d. All the above

86. Quantitative calculations of dynamics about how velocities change when forces are applied for a given mass can be done by using
- Newton's first law of motion
 - Newton's second law of motion
 - Newton's third law of motion
 - None of these
87. What is one Newton?
- Newton is the force needed to accelerate 1 kilogram of mass at the rate of kilo meter per second squared.
 - Newton is the force needed to accelerate 1 gram of mass at the rate of 1 meter per second squared.
 - Newton is the force needed to accelerate 1 gram of mass at the rate of 1 millimeter per second squared.
 - Newton is the force needed to accelerate 1 kilogram of mass at the rate of 1 meter per second squared.
88. What is wet bulb temperature?
- It is the temperature a parcel of air would have if it were cooled to 100% relative humidity) by the evaporation of water into it, with the latent heat being supplied by the parcel.
 - It is the temperature a parcel of air would have if it were cooled to 75% relative humidity) by the evaporation of water into it, with the latent heat being supplied by the parcel.
 - It is the temperature a parcel of air would have if it were cooled to 50% relative humidity) by the evaporation of water into it, with the latent heat being supplied by the parcel.
 - None of these.
89. In which of the following do you find an air cycle machine (ACM)?
- Air-conditioned buses
 - Gas turbine-powered aircraft
 - Small motor vehicles
 - All the above
90. Which of the following is an example of bootstrap operation?
- Gas turbine engines used in aircrafts
 - Wankel engine
 - Steam engine
 - None of these
91. What is the Volumetric efficiency of a 100cc hydraulic pump if the flow out of a pump is 90cc per revolution?
- 111%
 - 90%
 - 0.90%
 - None of these
92. An air compressor is a device that converts power from an electric motor, a diesel engine or a gasoline engine into _____ before putting it to use.
- Potential energy
 - Electrical energy
 - Acoustic energy
 - None of these
93. Which of the following is true with respect to jet engines?
- It is a reaction engine.
 - It generates thrust by jet propulsion in accordance with Newton's laws of motion.
 - Both a and b
 - None of these

94. Which of the following can be categorized as a reaction engine?
a. Diesel engine b. Electric motor c. Rocket engine d. None of these
95. What is the SI unit of measurement for tensile toughness?
a. Joule per metre b. Joule per second
c. Joule per kilogram d. Joule per cubic metre
96. The progressive and localized structural damage that occurs when a material is subjected to cyclic loading is called _____.
a. Shrinkage b. Fatigue c. Break-even point d. Compression
97. What is the difference between Ductility and Malleability?
a. Ductility is a solid material's ability to deform under tensile stress where as malleability is a material's ability to deform under compressive stress.
b. The two are one and the same.
c. Ductility applies to solids where as malleability applies to fluids.
d. Malleability applies to metals where as ductility applies to gases.
98. A close nipple can be unscrewed, without damaging the threads, by using a _____.
a. Pipe wrench b. Stillson wrench c. Nipple wrench d. None of these
99. The indentation hardness of materials can be characterized by _____.
a. Prandtl Scale b. Brinell Scale c. Denting Scale d. None of these
100. Silicon carbide can be extracted from which of the following minerals?
a. Silica b. Moissanite c. Molybdenum oxide d. Malectite

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83. The compression ratio in the diesel engine is higher than that of the petrol engine because
- It makes the petrol engine lighter
 - Due to pre – ignition, it is not possible to have higher or equivalent compression ratios in petrol engines
 - Less compression ratio gives better performance
 - None of the above
84. The steering rod is connected to the knuckles via the
- The tie rod
 - The spline
 - The pivot
 - The sector gear
85. How many exhaust manifolds does a V 6 engine have?
- 1
 - 2
 - 3
 - 4
86. The cylinder head gasket
- Prevents the combustion gasses from leaking from the joint between the cylinder head and the cylinder block.
 - Prevents engine oil from going in to the combustion chamber.
 - Removes impurities from the cylinder head lubricating oil.
 - None of the above.
87. The cam shaft of a 4 stroke diesel engine running at 1000 rpm will run at
- 500 rpm
 - 1000 rpm
 - 2000 rpm
 - 4000 rpm
88. Ball joints are used at the end of the tie rods. This is because these joints
- Ensure that the noise generated is reduced
 - Ensures reduction in the amount of the sliding resistance
 - Improves the force transmission speed
 - Deal with the movements of the suspension vertically as well as in other directions
89. The most commonly used anti-freeze solution in automobiles is
- Carbon disulphide
 - Ethylene glycol
 - Ammonium chloride
 - Freon – 12
90. When a vehicle is turning a corner
- The front wheels are toeing out
 - The front wheels are on different angles
 - The inside front wheels have a greater angle than the other wheels
 - All of the above
91. The force – fed lubrication system implies that oil is delivered to the engine by
- Gravity
 - The pressure created by the oil pump
 - Splashing action of the crankshaft
 - None of the above
92. The size of an engine cylinder is expressed in terms of its
- Bore and stroke
 - Diameter and bore
 - Bore and length
 - Displacement and efficiency

93. The battery in an automobile primarily
a. Supplies electricity to the alternator
b. Acts as a reservoir of electricity
c. Supplies a large amount of power to turn the starter motor when the engine is being started
d. Supplies electricity to the vehicles electrical system at all times
94. The octane number of compressed natural gas (CNG) is
a. 90 b. 100 c. 110 d. 120
95. The most commonly used power plants in automobiles is
a. Gas turbine b. Battery c. I. C. engine d. None of these
96. For a diesel engine, the duration between the time of injection and the time of ignition is called
a. Delay period b. Ignition period c. Injection period d. Spill cut – off
97. Which of the following devices smoothens out the power impulses from the engine
a. Torque convertor b. Differential c. Flywheel d. Clutch
98. The heat transfer from coolant to air in the radiator of an automobile engine takes place by
a. Radiation only b. Convection only
c. Convection and Radiation d. Conduction, Convection and Radiation
99. The piston compression rings are made of
a. Cast iron b. Steel c. Aluminum d. Bronze
100. The crescent-shaped cavity on the piston head top surface is called as
a. Snap ring b. Valve recesses c. Piston oil hole d. Valve clearance