UKPSC JE 2022 PAPER - 2

Q1. The metacentric height of a ship is 0.6 m and the radius of gyration is 4 m. The time of rolling of a ship is

(a) 4.1 s   (b) 5.2 s

(c) 10.4 s   (d) 14.1 s

Q2. When a body, floating in a liquid, is given a small angular displacement, it starts oscillating about a point known as

(a) Centre of pressure

(b) Centre of gravity

(c) Centre of buoyancy

(d) Meta centre

Q3. The Chezy co-efficent C is related to Manning's roughness co-efficient n as

(a) $C = n y_m^{\frac{1}{6}}$ (b) $C = \frac{1}{n} y_m^{\frac{1}{6}}$

(c) $C = n y_m^{\frac{1}{3}}$ (d) $C = n y_m^{\frac{1}{2}}$

Q4. Loss of head due to sudden expansion of flow stream in a closed conduit is expressed by

(a) $(V_1^2 - V_2^2)$ (b) $(V_1 - V_2)^2/2g$

(c) $(V_1 + V_2)^2/2g$ (d) $(V_1 - V_2)/2g$

Q5. The Euler's equation of motion is a statement of

(a) Energy balance

(b) Conservation of momentum for an inviscid fluid

(b) Conservation of momentum for an incompressible flow

(d) Conservation of momentum for a real fluid

Q6. Stability of a freely falling object is assured if its

(a) Centre of buoyancy lies below its centre of gravity

(b) Centre of gravity coincides with its centre of buoyancy

(c) Centre of gravity lies below its meta centre

(d) Centre of buoyancy lies below its meta centre

Q7. The depth of fluid is measured in vertical Z-direction; X and Y are the other two directions and are mutually perpendicular. The static pressure variation in the fluid is given by

(a) dp/dz = g   (b) dp/dz = ρ

(c) dp/dz = ρg (d) dp/dz = $-\rho g$

Q8. Stoke is unit of

(a) Absolute viscosity

(b) Rate of strain

(c) Kinematic viscosity

(d) Velocity gradient

Q9. The work requirement of a reciprocating pump with increase in acceleration head

(a) Increases   (b) Decreases

(c) Remains same   (d) none of the above

Q10. Draft tube

(a) Is mainly used in reaction turbine

(b) Recovers the loss of head as runner exit

(c) Is used in impulse turbine

(d) Both a and b

Q11. Velocity of flow at inlet and velocity of flow at outlet is same in

(a) Pelton turbine   (b) Francis turbine

(c) Kaplan turbine   (d) None of the above

Q12. Specific speed of hydraulic turbine depends upon

(a) Speed, power and discharge

(b) Discharge and power

(c) Speed and head

(d) Speed, power and head

Q13. Hydraulic machines are devices that convert

(a) Hydraulic energy into mechanical energy only

(b) Mechanical energy into hydraulic energy only

(c) Both a and b

(d) None of the above

Q14. A fluid is said to be ideal, if it is

(a) Incompressible

(b) Inviscous

(c) Viscous and incompressible

(d) Inviscous and incompressible

Q15. In thermit welding the high temperature is produced by:

(a) An electric arc

(b) An exothermal chemical reaction

(c) The combustion of oxygen and acetylene

(d) None of these

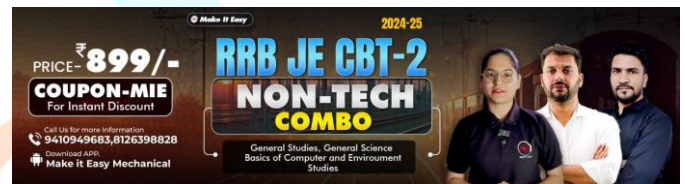**Q16. In electrical resistance welding the voltage of current is in the range of**

(a) 4 to 12 V   (b) 25 to 50 V

(c) 120 to 240 V   (d) 240 to 444 V

Q17. In laser welding the heat is supplied by

(a) The oxyacetylene gas

(b) The electric arc

(c) The collimated light beam

(d) Inducing the current

Q18. The tool used for lifting the pattern from the mould is called:

(a) Trowel   (b) Slick

(c) Lifter   (d) Draw spike

Q19. Which of the following material is used for making of pattern?

(a) Aluminium   (b) Plastics

(c) Wax   (d) All of the above

Q20. Slag inclusion in casting is a

(a) Surface defect   (b) Internal defect

(c) Crack   (d) Notch

Q21. Which of the following is not a casting process?

(a) Cathias process   (b) Extrusion

(c) Slush process   (d) Shell moulding

Q22. The mould is housed in a

(a) Flask   (b) Cope

(c) Drag   (d) Moulding box

Q23. Oxygen to Acetylene ratio in case of neutral flame is

(a) 0.8 : 1   (b) 1 :1

(c) 1.2 :1   (d) 2:1

Q24. Grey cast iron is usually welded by following:

(a) Gas welding   (b) Arc Welding

(c) TIG welding   (d) MIG welding

Q25. Weld Spalter is

(a) Flux   (b) Welding defect

(c) Electrode coating   (d) Welding test

Q26. The material used for coating the electrode is called

(a) Protective layer   (b) Binder

(c) Slag   (d) Flux

Q27. Open circuit voltage for Arc welding is of the order of

(a) 18-40 volts   (b) 40-95 volts

(c) 100-125 volts   (d) 130-170 volts

Q28. The property of sand due to which it evolves a great amount of steam and other gases is called

(a) Collapsibility   (b) Permeability

(c) Cohesiveness   (d) Adhesiveness

Q29. When a pattern is made in three parts, the top part is known as

(a) Drag   (b) Cheek

(c) Cope   (d) None of the above

Q30. Powder metallurgy techniques are used in the production of

(a) HSS tools   (b) Tungsten Carbide tools

(c) Twist drills   (d) Ceramics

Q31. The piercing and punching operation, the angle of shear is provide on

(a) Die   (b) Punch

(c) Both Punch and Die

(d) None of the above

Q32. The process extensively used for making bolts and nuts is

(a) Hot piercing   (b) Extrusion

(c) Cold peening   (d) Cold heading

Q33. Coining is the operation for

(a) Cold forging   (b) Hot forging

(c) Cold extrusion   (d) Piercing

Q34. Green sand is a mixture of

(a) 30% sand and 70% clay

(b) 50 % sand and 50% clay

(c) 70% sand and 30% clay

(d) 90% sand and 10% clay

Q35. Which of the following welding process uses non-consumable electrodes?

(a) TIG welding

(b) MIG welding

(c) Manual arc welding

(d) Submerged arc welding

Q36. The sand used for making cores is

(a) Green sand   (b) Dry sand

(c) Loam sand   (d) Oil sand

Q37. Metal patterns are used for

(a) Small castings

(b) Large castings

(c) Complicated castings

(d) Large scale production of castings

Q38. The mode of deformation of the metal during spinning is

(a) Bending

(b) Stretching

(c) Rolling and Stretching

(d) Bending and Stretching

Q39. Two streams of metal that are not hot enough to fuse properly, result into a casting defect known as:

(a) Cold shots

(b) Swell

(c) Shrinkage

(d) Sand wash

Q40. Disposable patterns are made of

(a) Wood

(b) Rubber

(c) Metal

(d) Polystyrene

Q41. Which is the most widely used metal for castings?

(a) Aluminum

(b) Brass

(c) Magnesium alloys

(d) Cast iron

Q42. The size of a press is specified by the following:

(a) Weight of the process

(b) Size of the workpiece it can handle

(c) Maximum load that can be applied to the workpiece

(d) Power required to operate the machine

Q43. Spot of odd one out

(a) Forging

(b) Cold rolling

(c) Swaging

(d) Hot extrusion

Q44. The process of putting a rod through several dies of decreasing diameter is known as

(a) Rolling

(b) Stretch forming

(c) Trimming

(d) Wire drawing

Q45. Forging process

(a) Eliminates porosity and blow holes

(b) Can be used to produce complicated shapes

(c) Give elastic deformation for shaping

(d) Uses continuous compressive force

Q46. The lathe is a machine that removes material by -------

(a) Feeding the work against a rotating cutter

(b) Rotating the work against cutter

(c) Rotating the work against a rotating cutter

(d) Feeding the work against a cutter having reciprocating motion

Q47. The front clearance angle of a shaper tool is:

(a) 4°

(b) 15°

(c) 25°

(d) 35°

Q48. In a planer

(a) The work is mounted on a table which reciprocates and tool is held rigid on the machine frame

(b) The tool is held on a ram which reciprocates and the work is mounted on a stationary motion

(c) Both the tool as well as the work have reciprocating motion.

(d) Both the tool as well as the work have rotatory motion

Q49. The shaper is used for machining of:

(a) Flat surfaces

(b) Cylindrical surfaces

(c) Spherical surfaces

(d) All of the above

Q50. The machine is used for machining flat surfaces of large size is:

(a) Lathe   (b) Milling

(c) Planer   (d) Shaper

Q51. The drill size for tapped hole is given by the relation:

(a) D = (T - d)   (b) D = (T + d)

(c) D = (T – 2d)   (d) D = (T+ 2d)

(Where, D = Drill size, T = Diameter of tape, d = Depth of hole)

Q52. Which is the manufactured abrasive material?

(a) Sandstone   (b) Diamond

(c) Silicon Carbide   (d) Garnet

Q53. Fixture are used in

(a) Milling   (b) Drilling

(c) Reaming   (d) Tapping

Q54. Function of Jig is

(a) To hold and locate the workplace

(b) To guide the tool

(c) Both (a) and (b)

(d) None of the above

Q55. Drilling is an example of

(a) Simple cutting   (b) Uniform cutting

(c) Orthogonal cutting (d) Oblique cutting

Q56. Buffing is an operation of

(a) Cleaning castings

(b) Depositing metal by spraying

(c) Broaching in reverse direction

(d) Producing luster on metal surface

Q57. Best coolant and lubricant for cast iron is

(a) Water soluble oils

(b) Mineral fatty acids

(c) Soluble oils

(d) None of the above

Q58. A hacksaw blade is specified by its

(a) Length   (b) Materials

(c) Width   (d) Number of teeth

Q59. Friction between chip and tool can be reduced by

(a) Increasing rake angle

(b) Increasing shear angle

(c) Increasing depth of cut

(d) Increasing sliding velocity

Q60. Identify the method which can be used for turning external tapers only.

(a) Form tool   (b) Compound test

(c) Taper attachment (d) Tailstock offset

Q61. The cutting force at the cutting edge of a tool during machining of metal is measured by

(a) Dynamometer   (b) Odometer

(c) Bolometer   (d) kentometer

Q62. the most important requisite of a cutting tool material is

(a) Carbon percentage

(b) Percentage of alloying elements

(c) Red (hot) hardness

(d) Easy fabrication

Q63. The tool life is influenced maximum by the following:

(a) Cutting speed

(b) Tool material and geometry

(c) Cutting fluid

(d) Surface conditions of the workpiece

Q64. No cutting fluid is normally used while machining of following material

(a) Aluminium (b) Alloy steel

(c) Cast iron   (d) Low carbon steel

Q65. Discontinuous or segmental chips are produced during machining of

(a) Cast iron   (b) Mild steel

(c) Copper   (d) High Carbon Steel

Q66. The cutting speed in turning operation would be least in case of

(a) Aluminium alloys   (b) Medium carbon steel

(c) Mild steel   (d) Stainless steel

Q67. Cutting tools may be provided with large positive rake angles to

(a) Have better heat dissipation

(b) Avoid rubbing with the finished surface

(c) Increase the strength of cutting edge

(d) Reduce the magnitude of cutting force

Q68. Which part of the cutting tool is prone to crater wear?

(a) Flank   (b) Face

(c) Shank   (d) Base

Q69. For cutting internal and external gear teeth, machine used is

(a) Planer   (b) Shaper

(c) Slotter   (d) Milling

Q70. Commonly used abrasives materials are

(a) Mica, glass, asbestos

(b) Alumina, silicon carbide and boron nitride

(c) Clay, quartz and borosilicate

(d) Oxide of magnesium, kaolin and feldspar

Q71. The helical groove in the drill body is known as

(a) Flute   (b) Tang

(c) Web   (d) Heel

Q72. The common value of point angle in standard drill is

(a) 90°   (b) 100°

(c) 118°   (d) 122°

Q73. The axis of cutter rotation is parallel to the workpiece surface to be machined in

(a) Up milling   (b) End milling

(c) Plain milling   (d) Face milling

Q74. Maximum friction is caused in

(a) Up milling   (b) Down milling

(c) End milling   (d) Climb milling

Q75. Tools in the case of ultrasonic machining are made of

(a) HSS   (b) Diamond

(c) Plain Carbon   (d) Brass or Copper

Q76. The ultrasonic welding is suitable for metal upto:

(a) 3 mm thick   (b) 5 mm thick

(c) 8 mm thick   (d) 10 mm thick

Q77. A body of sand used in a mould to form a hole or recess in a casting is known as:

(a) Core   (b) mould

(c) Core box   (d) None of these

Q78. The metal moulds are used in

(a) Green sand mould

(b) Dry sand mould

(c) Die casting process

(d) Loam moulding

Q79. Which one of the following materials will require the largest size of riser for the same size of casting?

(a) Aluminium   (b) Cast iron

(c) Steel   (d) Copper

Q80. The type of chip obtained by machining hard and brittle material is:

(a) Continuous chip with built up edge

(b) Continuous chip

(c) Discontinuous chip

(d) Inhomogeneous chip

Q81. The cathode (tool) and the anode (workpiece) in Electro Discharge Machining (EDM) are separated by

(a) A dielectric fluid

(b) An electrolyte

(c) An insulating material

(d) None of the above

Q82. In Electro-Discharge Machining (EDM), the commonly used material of the tool is

(a) High speed steel   (b) Brass or copper

(c) Carbide   (d) Diamond

Q83. The appearance of Laser beam is

(a) Greenish   (b) Reddish

(c) Yellowish   (d) Whitish

Q84. Sand is generally specified by its

(a) Grain size   (b) color

(c) Moisture content   (d) all of the above

Q85. Which of the following is a screen?

(a) Shovel   (b) Riddle

(c) Sand hammer   (d) Slick

Q86. Which wood can be used for making patterns?

(a) Mahogany   (b) Pine woods

(c) Teak wood   (d) all of the above

Q87. A sprue hole is

(a) A casting defect

(b) A hole made for riveting

(c) A blind hole in jigs

(d) An opening in mould for pouring molten metal

Q88. In grinding, for faster removal of metal:

(a) Fine grain size is used

(b) Medium grain size is used

(c) Coarse grain size is used

(d) Any grain size is used

Q89. For ferrous metal, the helix angle of drill is

(a) 30°   (b) 45°

(c) 60°   (d) 90°

Q90. For drilling operation, the cylindrical job should always be clamped on a

(a) Collet   (b) Jaw

(c) Vise   (d) V-block

Q91. Feed rate in milling operation is specified by

(a) RPM

(b) RPM × No. of teeth

(c) RPM × Feed per tooth × No. of teeth

(d) None of the above

Q92. Size of shaper is equal to

(a) Length of stroke

(b) Size of table

(c) Maximum size of tool

(d) Ratio of forward to return stroke

Q93. Lathe bed is usually made of

(a) Structural steel   (b) Stainless steel

(c) Cast iron   (d) Mild steel

Q94. In tool signature, the nose radius is indicated

(a) In the first position (b) In the last position

(c) In the middle   (d) Second from last

Q95. DIN specifications have been developed in

(a) Germany   (b) Russia

(c) England   (d) America

Q96. Cementide carbide tools are generally poor in the following conditions

(a) Compression   (b) Tension

(c) Shear   (d) Torsion

Q97. To clean a hand file,

(a) It is dipped in water

(b) It is dipped in dilute acid

(c) It is rubbed on stone

(d) File card is used

Q98. In a centreless grinding, the workpiece advances by

(a) Push given by operator

(b) Hydraulic force

(c) Force exerted by grinding wheel

(d) Force exerted by regulating wheel

Q99. While machining a brass casting on a lathe, the type of chuck used is

(a) Collet chuck   (b) Magnetic chuck

(c) Three jaw chuck   (d) Four jaw chuck

Q100. A knee is a part of the following:

(a) Lathe machine   (b) Shaper machine

(c) Milling machine   (d) Jig Boring machine

Q101. A mandrel is

(a) A slightly tapered hardened steel shaft that supports works which cannot be supported otherwise

(b) a tapered gauge used for inspection of tapered holes

(c) Auxiliary chuck used on lathe for holding small loads

(d) used in lathe work to hold castings

Q102. In sheet metal shop, tool made up of hardened steel which is used for marking out and to locate the centre in a permanent manner is

(a) Divider   (b) Punch

(c) Trammel   (d) Stake

Q103. Large size bolt heads are made by

(a) Swaging   (b) Roll forging

(c) Upset forging   (d) Blanking

Q104. In a sand casting, core is used to

(a) Make desired recess in casting

(b) Strengthen moulding sand

(c) Support loose pieces

(d) Remove pattern easily

Q105. In a gas turbine, the air is compressed to a pressure of:

(a) 3 to 6 kgf/cm^2 (b) 30 to 60 kgf/cm^2

(c) 0.3 to 0.6 kgf/cm^2 (d) 10 to 15 kgf/cm^2

Q106. In two stage compressor, when will the efficiency be maximum?

(a) $p_2 = p_1 \times p_3$ (b) $p_2 = \sqrt{\dfrac{p_1}{p_3}}$

(c) $p_2 = \sqrt{p_1 \times p_3}$ (d) $p_2 = \sqrt{p_1 + p_3}$

(Where, p_1 = Initial pressure, p_2 = Pressure after first stage, p_3 = Final pressure)

Q107. Rotary compressor are used for producing:

(a) Large quantity of air at high pressure

(b) Large quantity of air at low pressure

(c) Small quantity of air at low pressure

(d) Small quantity of air at high pressure

Q108. In two stroke engine, the number of power strokes are equal to:

(a) Number of revolutions per minute of crank shaft

(b) Twice the number of revolutions of crank shaft

(c) Half the number of revolutions of crank shaft

(d) Four times the number of revolutions of crank shaft

Q109. In reaction steam turbine the expansion of steam takes place inside the:

(a) Moving blades

(b) Fixed blades

(c) Fixed as well as moving blades

(d) Nozzles

Q110. The operation of Impulse steam turbine depends on the:

(a) Pressure energy of steam

(b) Kinetic energy of steam

(c) Datum energy of steam

(d) None of these

Q111. For the safety of the boiler, which of the mounting is provided more than one in number:

(a) Fusible Plug   (b) Safety valve

(c) Feed Check valve   (d) Steam Stop Valve

Q112. The maximum working pressure of fire tube boiler is limited to:

(a) 1.5 kgf/cm² (b) 5 kgf/cm²

(c) 20 kgf/cm²   (d) 100 kgf/cm²

Q113. Kerosene is distilled at

(a) 30 - 65℃   (b) 65 − 220℃

(c) 220 − 350℃   (d) 350 − 450℃

Q114. The Air-fuel ratio in gas turbine is of the order of

(a) 7:1   (b) 15:1

(c) 30:1   (d) 50:1

Q115. Mechanical efficiency of Gas turbine as compared to IC Engine is

(a) Higher

(b) Lower

(c) Same

(d) Depends on other considerations

Q116. The number of fire tubes in Lancashire Boiler is

(a) One   (b) Two

(c) Four   (d) Six

Q117. The thermal efficiency of a gas engine is of the order of:

(a) 92%   (b) 52%

(c) 34%   (d) 25%

Q118. The thermal efficiency of a diesel engine is of the order of:

(a) 92%   (b) 68%

(c) 52%   (d) 34%

Q119. Carburetion is done to

(a) Feed petrol to cylinder

(b) Govern the engine

(c) Breakup and mix the petrol with air

(d) Scavenge the cylinder

Q120. In a single acting reciprocating air compressor, without clearance, the compression of airmay be
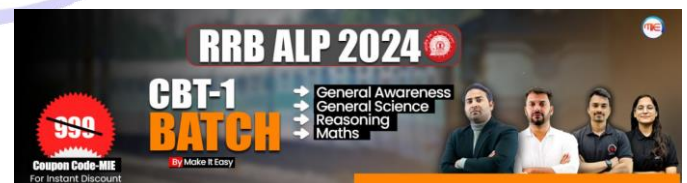
(a) Isothermal   (b) Polytropic

(c) Isentropic   (d) Any one of the above

Q121. In petrol engine, if diesel is used, then the engine will

(a) Not run   (b) Run more efficiently

(c) Run at high speed (d) Explode

Q122. The action of steam in a steam turbine is

(a) Static

(b) Dynamic

(c) Static and dynamic both

(d) Neither static nor dynamic

Q123. A fusible plug is fitted in small boilers in order to

(a) Avoid excessive buildup of pressure

(b) Avoid explosion

(c) Extinguish fire if water level in the boiler falls below alarming limit

(d) Remove molten ash

Q124. Which of the following is a fire tube boiler?

(a) Locomotive boiler

(b) Babcock and Wilcox boiler

(c) Stirling boiler

(d) All of the above

Q125. Which type of the engine most cars have?

(a) Two stroke cycle engine

(b) Four stroke cycle engine

(c) Rotary Wankel engine

(d) Free piston engine

Q126. Which is not the common component between a petrol and a diesel engine?

(a) Cam shaft   (b) Exhaust silencer

(c) Spray nozzle   (d) Dynamo

Q127. Compounding of a steam turbine is done to

(a) Balance the rotor

(b) Reduce the blade friction

(c) Reduce the rotor speed

(d) Connect the shaft of one turbine to that of another

Q128. A single stage impulse turbine is generally not used in practical because

(a) It cannot generate more power

(b) Heat energy is not utilized fully

(c) It has very low efficiency

(d) It needs large reduction gearing due to high speeds

Q129. The volumetric efficiency of a reciprocating compressor which compresses air from pressure p_1 to p_2 (index of compression n) is

(a) $1 + k - k \left(\frac{p_2}{p_1}\right)^{\frac{1}{n}}$ (b) $1 - k + k \left(\frac{p_2}{p_1}\right)^{\frac{1}{n}}$

(c) $1 + k - k \left(\frac{p_1}{p_2}\right)^{\frac{1}{n}}$ (d) $1 - k + k \left(\frac{p_1}{p_2}\right)^{\frac{1}{n}}$

Where k, is clearance ratio.

Q130. Clearance volume in a cylinder of engine should be:

(a) As large as possible

(b) As small as possible

(c) About 50 percent of swept volume

(d) None of these

Q131. In a Diesel engine cycle, compression ratio is 12 and cut off is 6 percent of stroke. The cut-off ratio is:

(a) 1.24   (b) 1.36

(c) 1.45   (d) 1.66

Q132. In case of Parson's reaction turbine, the degree of reaction is:

(a) 0.0   (b) 0.5

(c) 1.0   (d) 1.5

Q133. An accessory of boiler is

(a) Air preheater   (b) Feed check valve

(c) Stop valve   (d) Blow-off cock

Q134. In an Otto cycle, the temperature at the end of compression and at the end of heat addition processes are 600 K and 1600 K respectively. The efficiency of Otto cycle is 60%. Specific heat at constant volume is 0.70 kJ/kg. Work done per kg of cycle is

(a) 316 Kj   (b) 359 kJ

(c) 420 kJ   (d) 446 kJ

Q135. The common refrigerant used in domestic refrigerator is:

(a) Ammonia　　　　(b) Sulphur dioxide

(c) Freon　　　　　(d) Carbon dioxide

Q136. The instrument used for measuring the psychrometric properties of air is known as:

(a) Thermometer　　(b) Hydrometer

(c) Psychrometer　　(d) Pyrometer

Q137. The dehumidification of air will change its:

(a) Dry bulb temperature

(b) Wet bulb temperature

(c) Humidity Ratio

(d) All of the above

Q138. A refrigerant should have

(a) High specific heat

(b) High Specific Volume

(c) High Latent heat

(d) High Boiling point

Q139. A refrigerant cycle is usually:

(a) Open cycle　　　(b) Closed cycle

(c) Mixed cycle　　　(d) Hybrid cycle

Q140. Which type of compressor is commonly used in room air-conditioner?

(a) Reciprocating　　(b) Rotary

(c) Screw　　　　　(d) Centrifugal

Q141. Refrigeration in aeroplane usually employs the following refrigerant

(a) CO_2　　　　　(b) Freon-11

(c) Freon-22　　　　(d) Air

Q142. The COP of a domestic refrigerator

(a) Is less than 1

(b) Is more than 1

(c) Is equal to 1

(d) Depends upon atmospheric conditions

Q143. The specific humidity during heating and humidification process

(a) Remains constant　(b) Increases

(c) Decreases　　　　(d) None of the above

Q144. The condition of refrigerant as it leaves the compressor in a vapour compression system is

(a) Saturated liquid

(b) Wet vapour

(c) Dry saturated vapour

(d) Superheated vapour

Q145. In a mechanical refrigeration system, the refrigerant has the maximum temperature

(a) In evaporator

(b) Before expansion valve

(c) Between compressor and condenser

(d) Between condenser and evaporator

Q146. A reversible engine has ideal thermal efficiency of 30%. When it is used as a refrigerating machine with all other conditions unchanged, the coefficient of performance will be

(a) 1.33   (b) 2.33

(c) 3.33   (d) 4.33

Q147. Which of the following aspect is not true in the context of dry compression in a vapour compression refrigeration cycle?

(a) Increase in refrigerating effect

(b) Increase in power consumption

(c) Improvement in coefficient of performance

(d) Complete evaporation in the evaporator

Q148. During which component of vapour compression refrigeration system, the enthalpy remains constant?

(a) Condenser   (b) Throttle valve

(c) Evaporator   (d) Compressor

Q149. In a one ton capacity water cooler, water enters at 30 ℃ at the rate of 200 lit/h. Taking specific heat of water at 4.16 kJ/kgK, the outlet temperature of water will be

(a) 3.5℃   (b) 6.3℃

(c) 23.7℃   (d) 15℃

Q150. Round the clock cooling of an apartment having a load of 300 MJ/day requires an air-conditioning plat of capacity about

(a) 1 ton   (b) 5 ton

(c) 10 ton   (d) 25 ton

Q151. The capacity of a refrigerator is 120 ton and COP is 10. The power required to run the refrigerator is

(a) 38 Kw   (b) 42 kW

(c) 45 kW   (d) 48 kW

Q152. In window AC,

(a) Installation is not easy compared to split AC

(b) Compressor and evaporator both are in one unit

(c) There is no noise

(d) None of the above

Q153. In air conditioning system, during dry climate, the range of sensible heat factor is

(a) 0.08 to 0.09   (b) 0.1 to 0.2

(c) 0.3 to 0.4   (d) 0.75 to 0.80

Q154. By-pass factor in air conditioning is given by,

(a) $\frac{T_c - T_s}{T_a - T_s}$ (b) $\frac{T_a - T_s}{T_c - T_s}$

(c) $\frac{T_c - T_s}{T_a + T_s}$ (d) 1 + contact factor

(Where, T_s =Surface temperature of cooling air, $T_A = Inlet\ temperature$, T_c =Outlet temperature)

Q155. Refrigerant R134a falls in the class of

(a) Chloro Flouro Carbons

(b) Hydro Chloro Fluoro Carbons

(c) Hydro Flouro Carbons

(d) Hydro Carbons

Q156. Which of the refrigerant has lowest freezing temperature?

(a) Carbondioxide   (b) Ammonia

(c) Freon 12   (d) Freon 22

Q157. The capacity of refrigerating machine is expressed as:

(a) Inside volume of cabinet

(b) Lowest temperature attained

(c) Gross weight of machine in tons

(d) Rate of abstraction of heat from space being cooled

Q158. The change in suction pressure in vapour compression refrigeration system

(a) increases co-efficient of performance

(b) Decreases work of compressor

(c) Decrease refrigeration effect

(d) Increases refrigeration effect

Q159. A Carnot refrigeration cycle absorbs 1050 kJ/min at 250 K and rejects heat at 300 K. Work required per second in kJ is

(a) 2.4   (b) 3.5

(c) 3.8   (d) 4.1

Q160. A venturimeter is used to measure discharge through:

(a) A pipe   (b) An open channel

(c) A weir   (d) A notch

Q161. The difference between the theoretical discharge and actual discharge of a pump is known as

(a) co-efficient of discharge

(b) Slip

(c) Percentage slide

(d) None of the above

Q162. Kaplan turbine is

(a) An axial flow reaction turbine

(b) An axial flow impulse turbine

(c) An inward radial flow reaction turbine

(d) An outward radial flow reaction turbine

Q163. The overall efficiency of Pelton wheel is about:

(a) 55%   (b) 65%

(c) 85%   (d) 99%

Q164. The vanes of a centrifugal pump move due to

(a) Pressure energy of water

(b) Kinetic energy of water

(c) Both pressure and kinetic energy of water

(d) Power supplied by a prime mover

Q165. The Bernoulli's theorem for liquid is applicable for:

(a) Turbulent flow   (b) Viscous flow

(c) Compressible flow (d) None of the above

Q166. A body is said to be floating when:

(a) $W > F_b$ (b) $W = F_b$

(c) $W < F_b$ (d) $F_b < W$

(Where, W = weight of body, F_b = Buoyant force)

Q167. Stability of floating body depends upon:

(a) Its volume

(b) Its weight

(c) Its metacentric height

(d) The specific weight of fluid

Q168. The maximum efficiency of transmission through a pipe is

(a) 50%   (b) 60%

(c) 62.5%   (d) 66.7%

Q169. Pressure drag results from

(a) Skin friction

(b) Deformation drag

(c) Development of a stagnation point

(d) Formation of wake

Q170. Which is more viscous lubricating oil?

(a) SAE 30　　　　　(b) SAE 40

(c) SAE 50　　　　　(d) SAE 80

Q171. The reciprocating pump has a slip of 3%. Its co-efficient of discharge (c_d) is:

(a) 0.30　　　　　(b) 0.97

(c) 0.67　　　　　(d) 0.70

Q172. The specific speed (N_s) of a centrifugal pump is given by

(a) $N\sqrt{Q}/H^{\frac{5}{4}}$　　　　(b) $N\sqrt{Q}/H$

(c) $N\sqrt{Q}/H^{\frac{3}{4}}$　　　　(d) $N\sqrt{Q}/H^{\frac{2}{3}}$

Q173. The power produced by a Reaction turbine is

(a) Proportional to H

(b) Inversely proportional to H

(c) Proportional to $\sqrt{H}$

(d) Inversely proportional to $\sqrt{H}$

Q174. A Pelton wheel is an

(a) Axial flow impulse turbine

(b) Inward flow impulse turbine

(c) Outward flow impulse turbine

(d) All of these

Q175. The discharge through a rectangular channel will be maximum, if its depth is

(a) Twice the width

(b) Same as its width

(c) Half of the width

(d) one third of the width

Q176. The discharge over a rectangular notch is expressed as –

(a) $\frac{2}{3}.C_d.b.\sqrt{2gH}$　　　(b) $\frac{2}{3}.C_d.b.\sqrt{2g}\times H$

(c) $\frac{2}{3}.C_d.b.\sqrt{2g}.H^{\frac{3}{2}}$　　(d) $\frac{2}{3}.C_d.b.\sqrt{2g}.H^{\frac{5}{2}}$

Q177. A weir is said to be narrow crested, if its crest width is less than

(a) Height of water

(b) Half the height of water

(c) Length of the weir

(d) Half the length of weir

Q178. Reciprocating air compressor is best suited for

(a) Large quantity of air at high pressure

(b) Small quantity of air at high pressure

(c) Small quantity of air at low pressure

(d) Large quantity of air low pressure

Q179. In a centrifugal pump, the regulating valve is provided on the

(a) Casing　　　　　(b) Delivery pipe

(c) Suction pipe　　　(d) Impeller

Q180. In a Francis turbine runner, the number of blades are generally between

(a) 2 to 4　　　　　(b) 4 to 8

(c) 8 to 16　　　　　(d) 16 to 24

ANSWER KEYS

Q1	c	Q19	d	Q37	d	Q55	d	Q73	c	Q91	c	Q109	c	Q127	c	Q145	c	Q163	c
Q2	d	Q20	a	Q38	d	Q56	d	Q74	a	Q92	a	Q110	b	Q128	d	Q146	b	Q164	d
Q3	b	Q21	b	Q39	a	Q57	a	Q75	d	Q93	c	Q111	b	Q129	a	Q147	c	Q165	d
Q4	b	Q22	*	Q40	d	Q58	a	Q76	a	Q94	b	Q112	c	Q130	b	Q148	b	Q166	b
Q5	b	Q23	b	Q41	d	Q59	d	Q77	a	Q95	a	Q113	c	Q131	d	Q149	d	Q167	c
Q6	c	Q24	a	Q42	c	Q60	d	Q78	c	Q96	b	Q114	d	Q132	b	Q150	a	Q168	d
Q7	d	Q25	b	Q43	b	Q61	a	Q79	a	Q97	d	Q115	a	Q133	a	Q151	b	Q169	d

Q8	c	Q26	d	Q44	d	Q62	c	Q80	c	Q98	d	Q116	b	Q134	c	Q152	b	Q170	d
Q9	c	Q27	b	Q45	*	Q63	a	Q81	a	Q99	d	Q117	d	Q135	c	Q153	d	Q171	b
Q10	d	Q28	b	Q46	b	Q64	c	Q82	b	Q100	c	Q118	d	Q136	c	Q154	a	Q172	c
Q11	a	Q29	c	Q47	a	Q65	a	Q83	b	Q101	a	Q119	c	Q137	c	Q155	c	Q173	a
Q12	d	Q30	b	Q48	a	Q66	d	Q84	a	Q102	b	Q120	c	Q138	c	Q156	d	Q174	*
Q13	c	Q31	b	Q49	a	Q67	d	Q85	b	Q103	c	Q121	a	Q139	b	Q157	d	Q175	c
Q14	d	Q32	d	Q50	c	Q68	b	Q86	d	Q104	a	Q122	b	Q140	b	Q158	*	Q176	c
Q15	b	Q33	a	Q51	c	Q69	c	Q87	d	Q105	d	Q123	c	Q141	d	Q159	b	Q177	b
Q16	a	Q34	c	Q52	c	Q70	b	Q88	c	Q106	c	Q124	a	Q142	b	Q160	a	Q178	b
Q17	c	Q35	a	Q53	a	Q71	a	Q89	a	Q107	b	Q125	b	Q143	b	Q161	b	Q179	b
Q18	d	Q36	d	Q54	c	Q72	c	Q90	d	Q108	a	Q126	c	Q144	d	Q162	a	Q180	d

SOLUTIONS

Q1. Solution (c): Given

Radius of gyration (K) = 4m

GM = 0.6m

Time period = $2\pi \sqrt{\dfrac{K^2}{GM.g}}$

Q2. Solution (d): Meta Centre is defined as the point about which a body starts oscillating when

body is tilted by a small angle. The meta-centre may also be defined as the point at which the line of action of the force of buoyancy will meet the normal axis of the body when the body is given a small angular displacement.

Q3. Solution (b): The Chezy co-efficent C is related to Manning's roughness co-efficient n as:

$$C = \frac{1}{n} y_m^{\frac{1}{6}}$$

Where C = Chezy's Constant

Y_m = Hydraulic Radius

n = Manning's Roughness Coefficient

Q4. Solution (b): Losses due to:

Sudden Expansion

$$h_{Exp} = \frac{(v_1 - v_2)^2}{2g}$$

Exit Loss

$$h_{exit} = \frac{v^2}{2g}$$

Q5. Solution (b): The Euler's equation for a steady flow of an ideal fluid along a streamline is a relation between the velocity, pressure and density of a moving fluid It is based on the Newton's Second Law of Motion which states that if the external force is zero, linear momentum is conserved.

Q6. Solution (c): Stability of body is governed by the metacentre of the floating body.

For stable body: Metacentre lies above its C.G

For unstable body: Metacentre lies below its C.G

For Neutral body: Metacentre lies on its C.G

Q7. Solution (d): The pressure at any point in a fluid at rest is obtained by the Hydrostatic Law, which states that the rate of increase of pressure in a vertically downward direction must be equal to the specific weight of the fluid at that point.

p = ρgh

Pressure distribution profile

dp/dz = -ω = -pg

dp = -ω.dz

It indicates that a negative pressure gradient exists upward along any vertical.

Q8. Solution (c): Stoke is the unit of kinematic viscosity and poise is the unit of dynamic viscosity in terms of cgs.

Q9. Solution (c): Acceleration head is a primary concern in reciprocating pump systems, due to the acceleration and deceleration of the liquid in the suction piping of these types of pumps.

Q10. Solution (d): Draft tube is one of the important component of reaction turbine and connects runner exit to tail race. The main functions of draft tube is to allow the installation of turbine above the tail race level without loss of head and to convert major part of kinetic energy coming out of runner into pressure energy.

Q11. Solution (a): In Pelton turbine each blade has

same angular velocity and same linear speed unlike Francis and Kaplan turbines.

Q12. Solution (d): $N_S = \frac{N\sqrt{P}}{H^{5/4}}$

$N = \text{speed} \quad P = \text{Power}$

$H = \text{head}$

Q13. Solution (c): The hydraulic machines generally use a liquid fluid that is the power to perform work.

Q14. Solution (d): An ideal fluid is a fluid that is incompressible and no internal resistance to flow (zero viscosity). In addition ideal fluid particles undergo no rotation about their center of mass (irrotational). An ideal fluid can flow in a circular pattern, but the individual fluid particles are irrotational.

Q15. Solution (b): In thermit welding, heating and coalescence is by superheated molten metal obtained from a chemical reaction between a metal oxide and a metallic reducing agent. Temperature around 2750°C produced in 30 seconds. Thus it involves highly exothermic chemical reaction for developing high temperature.

Q16. Solution (a): The current is often in the range 1 000–100 000 A, and the voltage in the range 1–30 V. To achieve joining, resistance welding machines must go through three basic steps: 1. Clamping or pressing together the workpieces with a certain mechanical force and holding them in the correct position.

Q17. Solution (c): Laser beam welding is a fusion welding process in which two metal pieces are joined together by the use of laser. The laser beam provides a concentrated heat source, focused to the cavity between the two metal pieces to be joined.

Q18. Solution (d): A draw spike is a pointed tool at one end and loop at the other. It is driven into a wooden pattern and withdraw pattern from the mould.

Q19. Solution (d): materials used for pattern making are wood, metal or plastics. Wax and Plaster of Paris are also used, but only for specialized applications.

Q20. Solution (a): Slag inclusion in casting is a surface defect.

Q21. Solution (b): In Carthias process, the cavity is filled with a pre-calculated quantity of metal and a core or plunger is inserted to force the metal into the cavity. So here's the option (b) is correct. Extrusion is not a casting process.

Q22. Solution (*): The mould is housed in a molding flask or molding box. a and d both answer are correct.

Q23. Solution (b): For **Carburising or Reducing flame**: oxygen to acetylene ratio is less than 1. For **Oxidising flame**: Oxygen to Acetylene ratio is greater than 1.

For **Neutral flame**: Oxygen to Acetylene ratio is equal to 1.

Q24. Solution (a): Grey cast iron is welded by gas welding. In welding grey cast iron Neutral flame is used sometimes slightly oxidized flame can also be used for grey cast iron welding.

Q25. Solution (b): Weld spatter is a welding defect while weld spelter is a flux. Here in question paper written work is "Weld Spalter". If it is spatter then it is defect but if it is spelter then it is filler material. Weld spatter is not a correct word.

Q26. Solution (d): A flux coating is a layer of a chemical that acts as a cleaning agent, a purifying agent, or a flowing agent. It protects the weld pool and solid metal from atmospheric contamination and helps in removing impurities from the weld pool.

Q27. Solution (b): The selection of an optimum value of Open Circuit Voltage depends on the type of base metal, a composition of electrode coating, type of welding current and polarity, type of welding process etc.

It generally varies from 50 V – 100 V

Q28. Solution (b): Permeability is a condition of porosity and thus is related to the passage of gaseous materials through the sand.

Q29. Solution (c): When a pattern is made in three parts, the top part is known as cope, the middle part known as cheek and the bottom part is known as drag.

Q30. Solution (b): Tungsten Carbide Hard Metals are primarily produced using a Powder Metallurgy process, whereby the powdered forms of tungsten carbide and cobalt are mixed using ball mills, a binder material is added to hold the powders together during the next stage of the process which is compaction or pressing.

Q31. Solution (b): Punching is a process in which the punch removes a portion of material from the large piece or a strip of sheet metal. For the blanking operation, shear is provided on the die face and for piercing operation shear is provided on the punch face.

Q32. Solution (d): Cold heading manufacturing is a multi-step process used to form metal parts at room temperature. Unlike other metal fabrication processes, hammers and dies are used at a high speed to form the metal without heating the material.

Q33. Solution (a): Coining is a cold press working operation in which the starting material is in the form of a blank of sheet metal. It is a pressing operation, it does not base on metal deformation.

Q34. Solution (c): Green sand is a mixture of 70% sand and 30% clay.

Q35. Solution (a): Tungsten Inert Gas (TIG) welding, also known as Gas Tungsten Arc Welding (GTAW) is an arc welding process that produces the weld with a non-consumable tungsten electrode.

Q36. Solution (d): Oil sand is used for making cores and it is sometimes also known as oil sand Core sand is highly rich silica sand mixed with oil blinders such as core oil which composed of linseed oil, resin, light mineral oil and other bind materials.

Q37. Solution (d): The metal patterns are durable: they undergo very less abrasion due to mold sand So they are used for large quantity of casting.

Q38. Solution (d): In spinning methods, a polymer solution or melt is extruded through a spinneret by the action of an external force, forming jets of stretched fibers that solidify by either drying or solidification.

Q39. Solution (a): A cold shut is a fault in the surface of a piece of metal caused by two streams of molten metal not joining properly when the piece is being cast.

Q40. Solution (d): Disposable pattern: A pattern which instead of being removed from the mould gets burnt and evaporated when the molten metal is poured into the moul(d)

Q41. Solution (d): Gray iron is one of the most frequently used casting materials in industrial manufacturing. Accounting for a large portion of casting supply markets, it is a strong, versatile substance.

Q42. Solution (c): The size of any press is determined by the maximum force or pressure that can be exerted by the ram on the work piece without any failure.

Q43. Solution (b): Cold rolling is a process by which metal is passed through rollers at temperatures below its recrystallization temperatures.

Q44. Solution (d): Wire drawing is a metalworking process used to reduce the cross-section of a wire by pulling the wire through a single, or series of, drawing dies.

Q45. Solution (*): Forging is the process by which a metallic part is deformed to final shape with the application of pressure and with or without the application of heat. It involves the application of compressive stress which exceeds the flow stress of the metal. This stress is applied either quickly or slowly.

Q46. Solution (b): Lathes are designed to remove material from workpieces by exposing them to a cutting tool. The workpiece is secured to the lathe, at which point it rotates while pressing into a cutting tool. The rotational movement of the workpiece allows for the fast, efficient and precise removal of material

Q47. Solution (a): Usually shaper tool is given a front clearance angle of 4 degrees and side clearance angle of 2 or 3 degrees. If front clearance is high, then the cutting edge will not be strong because of lack of supporting metal and tool may dull quickly or crumble.

Q48. Solution (a): Planer is a machine tool used for producing accurate flat surfaces and cutting slots. Table supports the work and reciprocates along

with the ways of the bed the table is made up of high quality cast iron.

Q49. Solution (a): Shaper is a reciprocating type of machine tool in which the ram moves the cutting tool backwards and forwards in a straight line. These surfaces may be horizontal, vertical, or inclined In general, the shaper can produce any surface composed of straight line elements.

Q50. Solution (c): Planer is used for the purpose of machining too large and heavy jobs. There is a table in planer known as platen on which the work piece is fixed firmly and the operation is performed.

Q51. Solution (c): D = T – 2d

Q52. Solution (c): Artificial abrasives are silicon carbide and aluminium oxide.

Q53. Solution (a): Fixture are used for holding the work in milling, grinding, planning and turning operations.

Q54. Solution (c): A jig is a type of tool used to control the location and/or motion of another tool. A jig's primary purpose is to provide repeatability, accuracy, and interchangeability in the manufacturing of products. A device that does both functions (holding the work and guiding a tool) is called a jig.

Q55. Solution (d): Drilling is oblique cutting because the angles of threads on drill bit are at an angle less than 90 degree.

Q56. Solution (d): Buffing is a surface finishing process, which is performed after polishing for providing a high luster to be polished surface. Buffing is a surface finishing process used to shine wood, metal, or composites using a wheel generally made up of cotton.

Q57. Solution (d)

Q58. Solution (a): Hacksaw frame is used along with a blade to cut metals of different sections and is specified by the type and maximum length of the blade that can be fixed. The distance between the adjacent teeth is known as the pitch of the blade.

Q59. Solution (a): By increasing the rake angle, chip flow will be easier and the friction will reduce.

Q60. Solution (d): Taper Turning with Tailstock set over Method: This method is employed for turning small tapers on longer jobs and is confined to external tapers only.

Q61. Solution (a): Dynamometers are devices used to measure cutting forces in machining operation.

Q62. Solution (c): Hot or Red Hotness: It is the ability of the cutting tools to withstand high temperatures without losing its cutting edge.

Q63. Solution (a): The sequence of parameters affecting tool life is**: Cutting speed > Feed > Depth of Cut**. Tool life is defined as the time interval between two successive regrinds.

Q64. Solution (c): No cutting fluid is normally used while machining cast iron because of the self-lubricating property of graphite present in cast iron. Lubrication in cast iron is dry or compressed air.

Q65. Solution (a): Continuous chips are not produced during the machining of Cast iron. Discontinuous chips are usually formed during machining of brittle materials like cast iron. The low cutting speed and small rake angle of the tool are responsible for the formation of discontinuous chips.

Q66. Solution (d): Stainless steel

Q67. Solution (d): Cutting tools are provided with a large positive rake angle mainly for reducing the magnitude of the cutting force.

Q68. Solution (b): Crater wear occurs on the rake face of the tool, while flank wear occurs on the relief (flank) face of the tool.

Q69. Solution (c): The slotter machine is used for

i. Cutting grooves, keyways and slots of various shapes.

ii. Used for making regular and irregular surfaces both internal and external.

iii. For handling large and awkward workpiece.

iv. For cutting internal or external gears and many other operations which cannot be easily machined in any other machine tool described before.

Q70. Solution (b): Abrasive materials are hard crystals that are either found in nature or manufactured. The most commonly used of such materials are aluminum oxide, silicon carbide, cubic boron nitride, and diamond.

Q71. Solution (a): In the drill body the flutes are the spiral grooves which run to the length of the drill; the flutes help to form the cutting edges.

Q72. Solution (c)

Q73. Solution (c): Plain milling, also known as surface or slab milling, refers to milling operations in which the cutting tool's axis of rotation is parallel to the surface of the workpiece. The process employs plain milling cutters which have teeth on the periphery that perform the cutting operation.

Q74. Solution (a): In which the cutter and feed move in the opposite direction i.e the rotary cutter moves against the fee(d) due to this opposite motion, the width of the cutting chips gradually increases from minimum to maximum. There is massive friction between the cutter and workpiece which results in generating a large amount of heat.

Q75. Solution (d): Ultrasonic machining is a nontraditional process. In this process abrasives contained in the slurry are driven against the work by a tool oscillating at low amplitude (25–100 microns) and high frequency (15–30 kHz) Tools are made of relatively ductile materials like brass, stainless steel or mild steel so that tool wear rate (TWR) can be minimize(d)

Q76. Solution (a)

Q77. Solution (a): A core is a preformed, bonded, sand insert placed into the mold to shape the interior of a casting or a part of the casting that cannot be shaped by the pattern. Cores are frequently used to create hollow sections or cavities in a casting.

Q78. Solution (c)

Q79. Solution (a): Aluminium shows maximum liquid shrinkage.

Q80. Solution (c): Discontinuous chip obtained by machining hard and brittle material while continuous chip obtained by machining tough and soft material.

Q81. Solution (a): Electro discharge machining (EDM) is based on melting and vaporization principle. In EDM process sufficient direct current (DC) voltage is applied between two electrodes, i.e., tool and workpiece separated by a dielectric fluid like kerosene.

Q82. Solution (b): Brass and copper is used as an copper electrode for EDM.

Q83. Solution (b)

Q84. Solution (a): Grain size (or particle size) is the diameter of individual grains of sediment, or the lithified particles in clastic rocks. The term may also be applied to other granular materials.

Q85. Solution (b): Riddle is a screen

Q86. Solution (d): All the given wood are used for making patterns.

Q87. Solution (d): In casting, a sprue is the passage through which a molten material is introduced into a mold.

Q88. Solution (c): A larger grain will cut freely, allowing fast cutting but poor surface finish. Ultra-fine grain sizes are for precision finish work.

Q89. Solution (a): For ferrous metal, the helix angle of drill is 30°

Q90. Solution (d): V-Blocks are precision metalworking jigs typically used to hold round metal rods or pipes for performing drilling or milling operations.

Q91. Solution (c): Feed rate = RPM ×Feed per tooth $\times No. of\ teeth$

Q92. Solution (a): The size of the shaper is specified by the maximum length of stroke or cut it makes. The maximum stroke length of the shaper is 900 mm.

Q93. Solution (c): Cast iron is commonly used for machinery housings or base due to its damping characteristics. It is also known for holding its shape when it is subjected to contraction and expansion due to temperature fluctuations.

Q94. Solution (b): Designation of tool
$$\alpha_b - \alpha_s - c_e - c_s - \gamma_e - \gamma_s - R$$

Q95. Solution (a): DIN stands for Deutsches Institute for Normung German [German Institute for Standardization] The DIN began in Berlin in 1917. Its initial purpose was quality assurance with the aim to improve global communication.

Q96. Solution (b): Cementide carbide tools are generally poor in the tension conditions.

Q97. Solution (d): A file card brush is used to clean a file to ensure longer life and efficiency. A file is a hand tool used in metalwork, woodwork and plastic work.

Q98. Solution (d): Centerless grinding is the process of removing material from the outside diameter of a work piece using an abrasive wheel. In its simplest form, a centerless grinder consists of the machine base, grinding wheel, regulating wheel and work blade.

Q99. Solution (d): We can use a 4 jaw chuck lathe to safely hold square, hexagonal, wound, and irregular-shaped workpieces, with the independent movement of the jaws enabling accurate adjustment.

Q100. Solution (c): Milling machine is used to cut slots, grooves, and drill and perform all operation like to shape the workpiece. The basic milling machine parts are base, column, arbor, knee, saddle, table, overhanging arm, elevating screw, ram et(c) These parts are responsible for proper working of milling machine.

Q101. Solution (a): Mandrel is used to support a partly machined workpiece while it is being finished, or as a core around which parts may be bent or other material forged or molded.

Q102. Solution (b): Trammel heads are marking out tools primarily used to draw large circles or arcs. They are sometimes called trammel points, or trammels.

Q103. Solution (c): Upset forging involves locally heating a metal bar and then, while holding it firmly with special tooling, applying pressure to the end of the bar in the direction of its axis to deform it.

Q104. Solution (a): A core is a preformed, bonded, sand insert placed into the mold to shape the interior of a casting or a part of the casting that cannot be shaped by the pattern.

Q105. Solution (d)

Q106. Solution (c): For maximum efficiency
$$p_2 = \sqrt{p_1 \times p_3}$$

Q107. Solution (b): A rotary compressor is a compressor that compresses the gas by the rotary motion of the roller in an enclosed cylinder. Rotary compressors are used where large quantities of air or gas are needed at relatively low pressure.

Q108. Solution (a)

Q109. Solution (c): Sol. In reaction steam turbine the expansion of steam takes place inside the fixed as well as moving blades.

Q110. Solution (b): Impulse turbines are defined as turbines in which high-velocity jets of water or steam collide with the blades of the turbine to rotate the turbine and produce electricity using this winding.

Q111. Solution (b): Each boiler shall be equipped with two safety valves for relieving the steam pressure. The diameter of the valve shall not be less than 19 mm.

Q112. Solution (c): As per given option, option (c) will be correct.

Q113. Solution (c): Kerosene is distilled at 220-350ºC and petrol is distilled at a temperature in range of 65-220ºC.
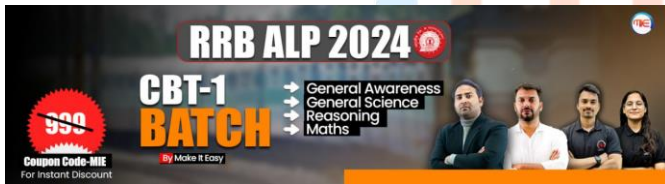
Q114. Solution (d): In a gas turbine cycle the energy is put into the system by burning fuel in flowing gas. The combustion is maintained in a stream of air moving with a high velocity in the region of 30-60 m/s. The air-fuel ratio vary from 60 : 1 to 120 : 1. The stoichiometric ratio is approximately 15 : 1.

Q115. Solution (a): Due to rotating components in IC engine there is more friction losses in IC engine as compared to Gas turbine so the efficiency of Gas turbine is more than the efficiency of IC engine.

Q116. Solution (b): There is two fire tubes in Lancashire boiler and one fire tube in Cornish boiler.

Q117. Solution (b): Modern gasoline engines have a maximum thermal efficiency of more than 50%, but road legal cars are only about 20% to 35% when used to power a car.

Q118. Solution (b): The thermal efficiency of petrol and gas engines is about 30% and the thermal efficiency of diesel engines is about 70%.

Q119. Solution (c): Carburetion: It is the job of the carburetor to regulate how much fuel and air gets mixed so that you get the proper combustible mixture.

Q120. Solution (c): In actual practice, the isothermal compression is not possible, since, it requires the compression process very slow in the order it maintains a constant temperature. So the correct option will be option (c).

Q121. Solution (a): If we add diesel in petrol engine then it will not run but if we will add petrol in diesel engine then it will explode.

Q122. Solution (b): A steam turbine works on the dynamic action of steam. Steam is caused to fall in pressure in a passage or nozzle. Due to this fall in pressure, certain amount of heat energy is converted into kinetic energy to give it high velocity.

Q123. Solution (c): The aim of a fusible plug is to shield the boiler from damage caused by low water levels overheating the boiler tubes.

Q124. Solution (a): Locomotive boiler is a fire tube, multi-tubular boiler which has a horizontal drum

axis. The circulation in this boiler is natural and it is a medium pressure boiler.

Q125. Solution (b): Most cars have four stroke cycle engine.

Q126. Solution (c): Nozzle is that part of an injector through which the liquid fuel is sprayed into the combustion chamber. It is used in Diesel engine in which fuel is drawn separately through injector at end of compression stroke and air is drawn into cylinder in suction stroke.

Q127. Solution (c): Compounding of steam turbine is used to reduce rotor speed. It is the process by which rotor speed come to its desired value. A multiple system of rotors are connected in series keyed to a common shaft and the steam pressure or velocity is absorbed in stages as it flows over the blades.

Q128. Solution (d): It is the first working impulse turbine. It consists of a single set of the nozzle and moving blades. Therefore, total pressure drop from boiler pressure to condenser pressure takes place in a single nozzle which gives high rotational speed exceeding pressure limit of 3000 rpm. This turbine

is generally not used in practical because it needs large reduction gearing due to high speeds.

Q129. Solution (a): $\eta_{vol} = 1 + k - k \left(\frac{p_2}{p_1}\right)^{\frac{1}{n}}$

Q130. Solution (b): Clearance volume or bumping clearance is the space between the top of the piston and the cylinder head of an air compressor. This clearance is an important aspect of the compressors and should be as less as practically possible to improve the volumetric efficiency of the compressor. The clearance volume should not be too less or too more.

Q131. Solution (d): Given

Compression ratio (r_c) = 12

cut off is 6% of stroke = 0.06

Cut off ratio (ρ) = 1 + 0.06 $(r_c - 1)$

$\rho = 1 + 0.06 \times 11 = 1.66$

Q132. Solution (b): Degree of reaction may also be defined as the ratio of enthalpy drop in the rotor to the enthalpy drop in the stage. For Parson's Reaction turbine R = 0.5, and for Hero's turbine R = 1

Q133. Solution (a): The purpose of the air preheater is to recover the heat from the boiler flue gas which increases the thermal efficiency of the boiler by reducing the useful heat lost in the flue gas.

Q134. Solution (c): Given

$T_2 = 600\ K\ ; T_1 = 1600K$

$\eta = 0.6$

$C_V = 0.70 \, kJ/kg$

As you know that the $\eta = \frac{W}{Q_1}$
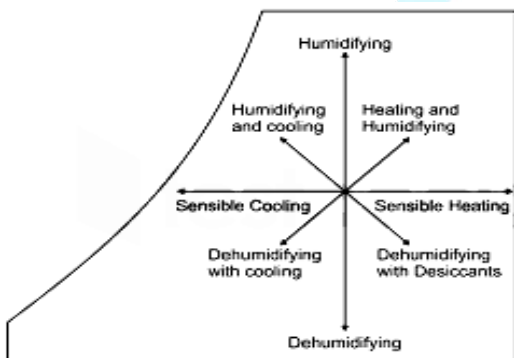
$W = 0.6 Q_1$

W = 0.6 $C_v(T_1 - T_2)$

$W = 0.6 \times 0.70 \times (1600 - 600)$

$W = 420 \, kJ$

Q135. Solution (c): R-12 or Freon 12 is used in domestic refrigerators and freezers, liquid chillers, dehumidifiers, ice makers, water coolers, water fountains and transport refrigeration.

Q136. Solution (c)

Q137. Solution (c):

The process in which the moisture or water vapor or the humidity is removed from the air keeping its dry bulb (DB) temperature constant and reduces the humidity ratio is called as the dehumidification process.

Q138. Solution (c):

1. Saturation pressure should be above or equal to the atmospheric pressure.

2. Latent heat evaporation high.

3. Refrigerant should be chemically stable.

4. It should not be nonflammable.

5. It should be non-toxic.

6. It should have low specific heat.

7. It have good thermal conductivity.

8. Eco-friendly.

Q139. Solution (b): Like vapour compression refrigeration cycle.

Q140. Solution (b): In Rotary compressors a pair of specially designed rotors rotate in opposite directions making the air to get trapped between causing compression. All types of room air conditioners – window, split, portable use rotary compressor.

Q141. Solution (d): Aircraft air refrigeration systems are required due to heat transfer from many external and internal heat sources (like solar radiation and avionics) which increase the cabin air temperature.

Q142. Solution (b): The COP of a domestic refrigerator is the ratio of the refrigeration capacity to the energy supplied to the compressor.

The COP of a domestic refrigerator is more than 1

Q143. Solution (b): You can see the result.
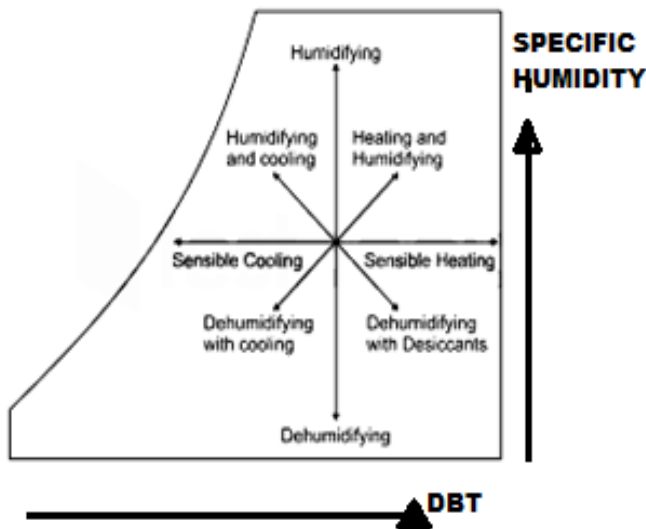
Q144. Solution (d): In a vapor compression system, the condition of refrigerant before entering the compressor is the dry saturated vapor. At the end of the compressor or entry point of the condenser, the state of refrigerant is superheated vapor.

Q145. Solution (c): You can refer the below diagram.
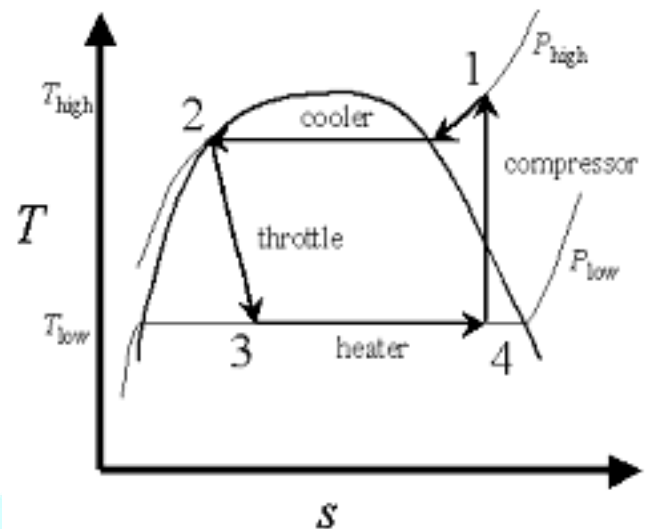
Q146. Solution (b): Given

$\eta = 0.3$

COP (h.p) = $\frac{1}{\eta}$ COP (h.p) = 3.33

COP (ref) = 3.33-1 $COP(ref) = 2.33$

Q147. Solution (c): Dry compression means that the entry point to the compressor is from saturated vapour and outlet of the compressor is a superheated vapour. For the same pressure ratio work required for the compressor is increased in dry compression.

Q148. Solution (b): Throttling is a process where a high-pressure fluid is converted into low-pressure by using a throttle valve. In a throttling process, the enthalpy remains constant and the work done is zero.

Q149. Solution (d): Cooling capacity = 1 ton = 3.5kJ/s = 3.5x3600 kJ/hour

Let t is the outlet temperature of water

Mass of water = density x volume = 1000 x 200 x 10⁻³ kg/hour = 200 kg/hr

Applying energy balance

3.5 × 3600 = 4.16 × 200 (30 - t)

∴ t = 15°C

Q150. Solution (a): 1 T refrigeration = 3.5 kW

Refrigerating capacity = (300 MJ/day)/3.5

$= \frac{300 \times 10^3}{3.5 \times 24 \times 3600} = 1 ton$

Q151. Solution (b): Given R.E $= 120 \times 3.5 = 420\ kW$

COP = 10 $COP = \frac{R.E}{W}$

10 $= \frac{420}{W}$ $W = \frac{420}{10} = 42\ kW$

Q152. Solution (b): Central air conditioning (or central A/C) is a system in which air is cooled at a central location and distributed to and from rooms by one or more fans and ductwork. The work of the air conditioner compressor is what makes the whole process of air conditioning possible.

Q153. Solution (d)

Q154. Solution (a): By pass factor is defined as the ratio of loss in cooling or heating to the ideal cooling or heating.

Q155. Solution (c): Designation of refrigerant

$= C_a H_b F_c Cl_d$

Designation = R (a-1)(b+1)c

Given refrigerant is R134a

so, from above equation we get: a=2, b = 2, c= 4

And for getting the value of d we apply expression

= b + c + d = 2a + 2

From above equation we get d = 0

Hence there is no chlorine present in above refrigerant. So the answer will be option (c).

Q156. Solution (d): Freon 12: -256 ℃

Q157. Solution (d): Refrigeration capacity is measured in tons of refrigeration (TR). One TR is the amount of heat that is required to be extracted from one ton of water at 0°C in order to convert it into equivalent ice at 0°C in a day.

Q158. Solution (*): Since here change is not mentioned as increasing or decreasing, so it difficult to choose the right option among the given options.

Q159. Solution (b): Given

$Q_2 = 1050\ kJ/min$ = 17.5 kW

$T_2 = 250\ K$ $T_1 = 300\ K$

$COP_{ref} = \frac{T_2}{T_1 - T_2} = \frac{Q_2}{W}$

$\frac{250}{300-250} = \frac{17.5}{W}$

$W = 3.5 \, kW$

Q160. Solution (a): A venturi meter is a measuring or also considered as a meter device that is usually used to measure the flow of a fluid in the pipe.

Q161. Solution (b): Slip of a reciprocating pump is defined as Difference of theoretical discharge and actual discharge.

Q162. Solution (a): Kaplan turbine is an axial flow reaction turbine. So the working fluid changes the pressure as it moves across the turbine and gives energy.

Q163. Solution (c): Overall efficiency of pelton wheel is about 85%.

Q164. Solution (d): A centrifugal pump is a mechanical device designed to move a fluid by means of the transfer of rotational energy from one or more driven rotors, called impellers. Fluid enters the rapidly rotating impeller along its axis and is cast out by centrifugal force along its circumference through the impeller's vane tips.

Q165. Solution (d): Assumptions of Bernoulli's Equation

i. The fluid is ideal, i.e., viscosity is zero

ii. The flow is steady

iii. The flow is incompressible

iv. The flow is irrotational, non-turbulent and 1 dimension.

Q166. Solution (b): For a floating body, weight is balanced by the buoyant force. Hence,

$W = F_B$

Q167. Solution (c): Stability of floating body depends upon metacentric height. The metacentric height (GM) is a measurement of the initial static stability of a floating body. It is calculated as the distance between the centre of gravity of a ship and its metacentre.

Q168. Solution (d): Condition for maximum efficiency

$h_L = \frac{H}{3}$ $\eta = 66.67\%$

Q169. Solution (d): Pressure drag comes from the eddying motions that are set up in the fluid by the passage of the body. This drag is associated with the formation of a wake in the flow. Frictional drag comes from friction between the fluid and the surfaces over which it is flowing.

Q170. Solution (d): SAE 80 is more viscous lubricating oil.

Q171. Solution (b): Given

$Slip = 0.03$

$Slip = 1 - C_d$

$C_d = 1 - 0.03 = 0.97$

Q172. Solution (c): Specific speed for pump:

$N_S = N\sqrt{Q}/H^{\frac{3}{4}}$

Q173. Solution (a):. $P = \rho Q g H$

Q174. Solution (*): Pelton wheel is a tangential flow impulse turbine.

Q175. Solution (c): The discharge through a rectangular channel will be maximum, if its depth is half of the width.

Q176. Solution (c): For rectangular notch

$$Q = \frac{2}{3} . C_d . b . \sqrt{2g} . H^{\frac{3}{2}}$$

Q177. Solution (b): Narrow Crested Weir: It is similar to rectangular weir with narrow shaped crest at the top. The discharge over narrow crested weir is similar to discharge over rectangular weir.

Q178. Solution (b): Reciprocating Air Compressor is a positive displacement air compressor in which air is sucked in a chamber and compressed with the help of a reciprocating piston. It is called as positive displacement compressor because air is first sucked in a chamber and then compression is achieved by decreasing area of the chamber.

Q179. Solution (b): A delivery valve is a regulating valve which is of sluice type and is required to be provided in order to control the flow from the pump into delivery pipe.

Q180. Solution (d): The Francis turbine is a type of water turbine. It is an inward-flow reaction turbine that combines radial and axial flow concepts. It has 16 to 24 blades.