

MIZORAM PUBLIC SERVICE COMMISSION
TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF
GRADE-V OF MIZORAM ENGINEERING SERVICE (AE/SDO)
UNDER POWER & ELECTRICITY DEPARTMENT, GOVERNMENT OF MIZORAM
JANUARY, 2012

MECHANICAL ENGINEERING
PAPER – I

Time Allowed : 3 hours

Full Marks : 200

All questions carry equal marks of 1 each.
Attempt all questions.

1. The average kinetic energy of translation possessed by molecules can be determined if the parameter measured is
 - (a) Pressure
 - (b) Volume
 - (c) Temperature
 - (d) Entropy
2. The first law of thermodynamics throws the light on the concept of
 - (a) Entropy
 - (b) Energy
 - (c) Strain
 - (d) Internal Energy
3. The Zeroth law deals with thermal equilibrium and establishes a concept of following
 - (a) Thermal energy
 - (b) Temperature
 - (c) Heat
 - (d) Temperature
4. The second law of thermodynamics throws the light on the concept of increase in
 - (a) Entropy
 - (b) Temperature
 - (c) Heat
 - (d) Pressure
5. A thermocouple consists of two dissimilar metals or alloys which develop e.m.f. when the reference and measuring junctions are at different level of
 - (a) Voltage
 - (b) Temperature
 - (c) Flux
 - (d) Thermions
6. An optical pyrometer can measure temperatures up to a limit of
 - (a) 1000°C
 - (b) 2000°C
 - (c) 3000°C
 - (d) 4000°C
7. All gases tend to ideal or perfect gas behavior at all temperatures as their pressure approaches
 - (a) Atmospheric
 - (b) Zero
 - (c) Maximum
 - (d) Critical
8. A barometer reads 760mm of mercury, its equivalent pressure in Bar is
 - (a) 4.2
 - (b) 420
 - (c) 0.42
 - (d) 42

9. The vacuum recorded in the condenser of a steam power plant is 740mm of mercury. If the barometer reading is 760mm of mercury then the absolute pressure in the condenser is
(a) 2668 Pa (b) 6682 Pa
(c) 2668 KPa (d) 6826 Pa
10. Mechanical friction occurring during a process due to some external source is an example of
(a) Reversibility (b) Irreversibility
(c) Availability (d) Unavailability
11. In an extensive property of a thermodynamic system
(a) Extensive heat is transferred (b) Extensive work is done
(c) Extensive energy is utilized (d) None of the above
12. Which of the following is an intensive property of a thermodynamic system?
(a) Volume (b) Temperature
(c) Mass (d) Energy
13. Which of the following is an extensive property of a thermodynamic system?
(a) Pressure (b) Volume
(c) Temperature (d) Density
14. Which one of the following components is not boiler mounting?
(a) Safety valve (b) Pressure gauge
(c) Feed pump (d) Stop valve
15. In a regenerative feed heating cycle, the optimum value of the fraction of steam extracted for feed heating
(a) decreases with increase in Rankine cycle efficiency
(b) increases with increase in Rankine cycle efficiency
(c) is unaffected by increase in Rankine cycle efficiency
(d) none of the above
16. Willan's line is a curve plotted of steam consumption rate in steam engine versus
(a) speed (b) indicated power
(c) frictional power (d) brake power
17. The effect of considering friction losses in steam nozzle for the same pressure ratio leads to
(a) increase in dryness fraction to exit steam (b) decrease in dryness fraction to exit steam
(c) no change in the quality of exit steam (d) none of the above
18. The reheat factor in steam turbine depends on
(a) exit pressure only (b) stage efficiency only
(c) initial pressure and temperature only (d) all the above
19. The pressure on the two sides of the impulse wheel of a steam turbine
(a) is same (b) is different
(c) increases from one side to other side (d) decreases from one side to other side

191. The sub-cooling in a refrigeration cycle
(a) increases C.O.P. (b) reduces cooling
(c) increases work of compressor (d) reduces condenser size
192. In air conditioning system, the amount of free air needed per person is
(a) 6 m³/min (b) 1.5 m³/min
(c) 1.2 m³/min (d) 1.2 m³/hr
193. Temperature of air recorded by an ordinary thermometer is known as
(a) wet bulb temperature (b) dry bulb temperature
(c) dew point temperature (d) saturation temperature
194. In a vapour compression refrigeration, dry compression means
(a) entire compression of vapour should be in wet region
(b) entire compression of vapour should be superheated region
(c) vapour enters the compression in dry saturated and leaves in a wet state
(d) none of these
195. Brine is always used as a secondary refrigerant in a
(a) cold storage plants (b) milk chilling plants
(c) cinema hall air conditioning plants (d) ice plants
196. In a psychometric chart, horizontal and uniformly spaced lines indicate
(a) dry bulb temperature (b) wet bulb temperature
(c) dew point temperature (d) specific humidity
197. During adiabatic saturation process on unsaturated air, the
(a) dry bulb temperature remains constant
(b) wet dry bulb temperature remains constant
(c) dew point temperature remains constant
(d) saturation temperature remains constant
198. Psychometric process is
(a) sensible heating (b) humidification
(c) dehumidification (d) all of these
199. Presence of moisture in Freon refrigeration system causes
(a) ineffective refrigeration (b) damage to compressor
(c) freezing at automatic regulating valve (d) none of these
200. In mechanical refrigerating system, the refrigerant occurs as liquid or very wet vapour between
(a) condenser and evaporator (b) condenser and compressor
(c) condenser and expansion valve (d) expansion valve and evaporator

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180. Net refrigerating effect of a refrigerant is proportional
- (a) directly to latent heat of refrigerant
 - (b) directly to square of latent heat of refrigerant
 - (c) inversely to latent heat of refrigerant
 - (d) none of these
181. The bank of tubes at the back of domestic refrigerator are
- (a) condenser tubes
 - (b) evaporated tubes
 - (c) refrigerant cooling tubes
 - (d) capillary tubes
182. The highest temperature encountered in the refrigeration cycle should be
- (a) near critical temperature of refrigerant
 - (b) above critical temperature
 - (c) at critical temperature
 - (d) much below critical temperature
183. In a refrigeration systems, heat absorbed in comparison to heat rejected is
- (a) more
 - (b) less
 - (c) same
 - (d) none of these
184. Humidity ratio is also called
- (a) relative humidity
 - (b) specific humidity
 - (c) absolute humidity
 - (d) none of these
185. If sensible heat added is 25,000 kJ/min and latent heat added is 20 kJ/sec, then sensible heat factor is equal to
- (a) 0.4
 - (b) 0.5
 - (c) 0.67
 - (d) 0.7
186. Temperature of air recorded by a thermometer when the moisture present in it begins to condense, is known as
- (a) wet bulb temperature
 - (b) dry bulb temperature
 - (c) dew point
 - (d) saturation temperature
187. Leakage in a refrigeration system using Freon as refrigerant is directed by
- (a) Halide torch
 - (b) Sulphur stick
 - (c) soap and water
 - (d) acetylene test
188. Boiling point of Freon-12 is
- (a) -10.5°C
 - (b) -29.8°C
 - (c) -40.8°C
 - (d) -35.8°C
189. The refrigerant used in air craft is
- (a) Ammonia
 - (b) CO₂
 - (c) air
 - (d) Freon -12
190. In a refrigeration cycle, the heat is absorbed by a refrigerant in a
- (a) evaporator
 - (b) condenser
 - (c) compressor
 - (d) expansion valve

20. The thermal efficiency of the engine with condenser compared to one without condenser, for a given pressure and temperature of steam is
- (a) higher
 - (b) lower
 - (c) unaffected
 - (d) same so long temperature remains constant
21. In a four stroke cycle engine, the four operations namely suction, compression, expansion and exhaust are completed in the number of revolutions of crank shaft equal to
- (a) four
 - (b) three
 - (c) two
 - (d) one
22. In a two stroke cycle engine, the four operations namely suction, compression, expansion and exhaust are completed in the number of revolutions of crank shaft equal to
- (a) four
 - (b) three
 - (c) two
 - (d) one
23. Which one of the following is a spark ignition (SI) engine?
- (a) Diesel engine
 - (b) Petrol engine
 - (c) Gas engine
 - (d) Electric engine
24. The ratio of brake power to indicated power of an I.C engine is called
- (a) mechanical efficiency
 - (b) thermal efficiency
 - (c) ideal cycle efficiency
 - (d) volumetric efficiency
25. The compression ratio of Petrol engine is in the range of
- (a) 2 to 3
 - (b) 7 to 10
 - (c) 16 to 20
 - (d) above 20
26. The compression ratio of Diesel engine may have the range of
- (a) 8 to 10
 - (b) 10 to 15
 - (c) 16 to 20
 - (d) none of the above
27. In a four cylinder Petrol engine the standard firing order is
- (a) 1-2-3-4
 - (b) 1-4-3-2
 - (c) 1-3-2-4
 - (d) 1-3-4-2
28. The ignition quality of fuels for S.I. engine is determined by
- (a) cetane number rating
 - (b) octane number rating
 - (c) calorific value rating
 - (d) volatility of the fuel
29. With increase in clearance volume, the ideal work of compressing 1 Kg of air
- (a) increases
 - (b) decreases
 - (c) remains same
 - (d) none of the above
30. In reciprocating air compressor the method of controlling the quantity delivered is done by
- (a) throttle control
 - (b) blow-off control
 - (c) clearance control
 - (d) all of the above

31. For the same overall pressure ratio, the leakage of air past the piston for multi stage compression as compared to single stage compression is
(a) more (b) less
(c) constant (d) may be more or less
32. The thermal efficiency of a gas turbine plant as compared to diesel engine plant is
(a) higher (b) lower
(c) same (d) may be higher or lower
33. Mechanical efficiency of a gas turbine as compared to internal combustion reciprocating engine is
(a) higher (b) lower
(c) same (d) unpredictable
34. Thermal efficiency of a closed cycle gas turbine plant increases by
(a) reheating (b) intercooling
(c) regenerator (d) all of the above
35. A system comprising of a single phase only is usually known as
(a) open system (b) closed system
(c) homogeneous system (d) heterogeneous system
36. Control volume under system approach refers to
(a) a specified mass (b) a fixed region in the space
(c) a closed system (d) none of the above
37. Specific heat is the amount of heat needed to raise the temperature
(a) by unit degree of a substance (b) by unit degree of unit mass
(c) of a unit mass by ten (d) None of the above
38. The ratio of specific heats of a gas at constant pressure and at constant volume
(a) varies with temperature (b) varies with pressure
(c) is always constant (d) none of the above
39. When two bodies are in thermal equilibrium with a third body they are also in thermal equilibrium with each other. This statement is
(a) Zeroth law of thermodynamics (b) first law of thermodynamics
(c) second law of thermodynamics (d) none of the above
40. The sequence of process that eventually returns the working substance to its original state, is known as
(a) event (b) thermodynamic cycle
(c) thermodynamic property (d) none of the above
41. For a closed system, the difference between the heat added to the system and the work done by the gas, is equal to the change in
(a) enthalpy (b) entropy
(c) internal energy (d) temperature

169. Coefficient of performance (C.O.P) under refrigeration system is always
(a) more than unity (b) less than unity
(c) equal to unity (d) none of these
170. Coefficient of performance of a domestic refrigerator as compared to that of an air conditioner is generally
(a) more (b) less
(c) same (d) none of these
171. In a refrigeration cycle, the moisture is to be removed before it enters the
(a) cold side of system (b) evaporator
(c) compressor (d) condenser
172. During the cooling process, the refrigerant characteristics which change constantly are
(a) phase and temperature (b) flow and pressure
(c) phase and flow (d) pressure and phase
173. Sometimes the evaporator is not cooled properly and it is due to
(a) leakage in refrigerator (b) faulty thermostat
(c) frozen oil (d) lot of frozen ice
174. The coefficient of performance (COP) of a refrigerator working on a reversed Carnot cycle is 5. The ratio of highest absolute temperature to lowest temperature would be
(a) 1.25 (b) 1.3
(c) 1.4 (d) 1.2
175. The refrigerant used in vapour absorption refrigerator is
(a) Freon-12 (b) Ammonia
(c) CO₂ (d) Aqua-ammonia
176. If a refrigerant is having low specific heat, then coefficient of performance (COP) will be
(a) lower (b) higher
(c) same (d) none of these
177. In vapour compression refrigerator working fluid vapour is
(a) Ammonia (b) Freon-12
(c) CO₂ (d) all of the above
178. Ratio of actual coefficient of performance to the theoretical coefficient of performance is known as
(a) refrigeration efficiency (b) relative coefficient of performance
(c) critical coefficient of performance (d) none of these
179. A refrigerator works on
(a) Bell-Coleman cycle (b) reversed Carnot cycle
(c) Carnot cycle (d) both (a) and (b)

157. Drag force on a 40:1 scale model of a ship is measured to be 10N. Force expected on the ship will be
(a) 640kN (b) 520kN
(c) 320kN (d) 80kN
158. For pipe flow under constant diameter, capacity is proportional to
(a) (head)^{1/2} (b) (head)
(c) (head)^{3/2} (d) (head)²
159. The river flow during floods can be classified as
(a) steady uniform flow (b) unsteady uniform flow
(c) steady non-uniform flow (d) unsteady non-uniform flow
160. In a free vortex motion, tangential velocity of the water particles is proportional to
(a) R (b) R²
(c) 1/R (d) 1/R²
161. Continuity equation for an incompressible fluid is written as
(a) A₁V₁=A₂V₂ (b) ρ₁ A₁V₁=ρ₂ A₂V₂
(c) A₁V₁/ρ₁=A₂V₂/ρ₂ (d) ρ₁ A₁/V₁=ρ₂ A₂/V₂
162. A fluid in which resistance of deformation is independent of the shear stress is known as
(a) Bingham plastic fluid (b) Pseudo plastic fluid
(c) Dilatent fluid (d) Newtonian fluid
163. The rate of change of momentum is equal to
(a) force exerted by fluid (b) torque applied by the fluid
(c) work done by the fluid (d) power developed by the fluid
164. Bernoulli's equation cannot be applied when the flow is
(a) rotational (b) turbulent
(c) unsteady (d) all of the above
165. Two forces most important in laminar flow between closely parallel plates are
(a) inertial and viscous (b) viscous and pressure
(c) gravity and pressure (d) pressure and inertial
166. The velocity distribution in the turbulent boundary layer follows
(a) straight line law (b) parabolic law
(c) hyperbolic law (d) logarithmic law
167. Head loss in case of hot water flow through a pipe compared to cold water flow will be
(a) same (b) more
(c) less (d) unpredictable
168. In S.I. units, one tonne of refrigeration is equivalent to
(a) 1.5 kW (b) 2.5 kW
(c) 3.5 kW (d) 5 kW

42. With rise of temperature, the specific heat of water
(a) increases (b) decreases
(c) first decreases to minimum then increases (d) remains constant
43. Internal energy of a perfect gas depends upon
(a) temperature only (b) temperature and pressure
(c) temperature, pressure and specific heats (d) none of the above
44. The difference between two specific heats, $C_p - C_v = \frac{R}{J}$. This relation is valid for
(a) ideal gases (b) perfect gases
(c) real gases (d) pure gases
45. The net work done in a polytropic process is given by
(a) $\frac{p_1 v_1 - p_2 v_2}{(n-1)}$ (b) $\frac{p_1 v_1 - p_2 v_2}{(1-n)}$
(c) $\frac{p_1 v_1 - p_2 v_2}{n}$ (d) none of the above
46. In an isothermal process, value of internal energy
(a) increases (b) remains constant
(c) decreases (d) none of the above
47. A process in which no heat is supplied or rejected from the system and entropy is not constant is known as
(a) isothermal (b) isentropic
(c) polytropic (d) hyperbolic
48. In a throttling process the enthalpy of fluid
(a) remains constant (b) increases
(c) decreases (d) none of the above
49. In a polytropic process equation $PV^n = \text{Constant}$, if $n=1$ the process is known as
(a) constant pressure process (b) constant volume process
(c) constant temperature process (d) none of the above
50. The condition for reversibility of a cycle is
(a) cyclic $\int \frac{dQ}{T} < 0$ (b) cyclic $\int \frac{dQ}{T} > 0$
(c) cyclic $\int \frac{dQ}{T} = 0$ (d) none of the above
51. Reduced pressure is
(a) always less than atmospheric pressure (b) always unity
(c) an index of molecular position of gas (d) dimensionless

52. For the same compression ratio, the efficiency of diesel cycle as compared to Otto cycle is
(a) less (b) more
(c) equal (d) none of the above
53. The efficiency of diesel cycle approaches to Otto cycle efficiency with
(a) increase in cut off (b) decrease in cut off
(c) zero cut off (d) constant cut off
54. Cycle generally used for gas turbine is
(a) Rankine cycle (b) Carnot cycle
(c) Otto cycle (d) Brayton cycle
55. Cycle that does not consist a set of isothermal processes is
(a) Carnot cycle (b) Brayton cycle
(c) Ericson cycle (d) Sterling cycle
56. The ideal efficiency of a gas turbine cycle depends upon
(a) pressure ratio (b) cut off ratio
(c) both (a) & (b) (d) none
57. For a simple gas turbine cycle the work ratio depends upon
(a) pressure ratio (b) maximum cycle temperature
(c) minimum cycle temperature (d) all of the above
58. One hundredth of a kilogram of air is compressed in a piston cylinder device. When temperature is 400K, the rate at which work is being done on the air is 8.165KW, and heat is being removed at a rate of 1KW, the rate of temperature rise will be
(a) 10K/Sec (b) 100K/Sec
(c) 1000K/Sec (d) 10000K/Sec
59. The loss of available energy associated with the transfer of 100KJ of heat from a constant temperature system at 600K to another at 400K when the environment temperature is 300K, is
(a) 500KJ (b) 250KJ
(c) 450KJ (d) 750KJ
60. For a pure substance at its triple point, the number of degrees of freedom is
(a) 0 (b) 1
(c) 2 (d) none of the above
61. Ninety kilograms of ice at 0°C are completely melted. If $T_2=0^\circ\text{C}$ then entropy change in KJ/Kg is
(a) 0 (b) 45
(c) 85 (d) 105
62. A system undergoes a state change from 1 to 2. According to the second law of thermodynamics for the process to be feasible, the entropy change (S_2-S_1) of the system is
(a) positive or zero (b) negative or zero
(c) zero (d) can be positive, negative or zero

146. The purpose of surge tank in a pipe line is to
(a) smoothen the flow of water (b) minimize friction loss in pipe
(c) prevent occurrence of hydraulic jumps (d) relieve pressure due to water hammer
147. Process of diffusion of one liquid into the other through a semi-permeable membrane is called
(a) viscosity (b) osmosis
(c) surface tension (d) cohesion
148. For pipe flows under constant diameter, the head is proportional to
(a) (flow) (b) (flow)²
(c) (flow)³ (d) (flow)⁻¹
149. The point in the immersed body through which the resultant pressure of the liquid may be taken to act is known as
(a) metacentre (b) centre of pressure
(c) centre of buoyancy (d) centre of gravity
150. To replace a compound pipe by a new pipe, the pipes will be equivalent when both the pipes have same
(a) length and flow (b) diameter and flow
(c) loss of head and flow (d) length and loss of head
151. Viscosity of water in comparison to mercury is
(a) higher (b) lower
(c) same (d) unpredictable
152. Speed of submarine can be measured by
(a) Pitot tube (b) Hot wire anemometer
(c) Pirani gauge (d) Inclined manometer
153. The thickness of laminar boundary layer at a distance x from the leading edge over flat plate varies as
(a) 2x (b) x²
(c) x^{1/2} (d) x^{4/5}
154. A piezometer can not be used for pressure measurement in pipes when
(a) pressure difference is low (b) velocity is high
(c) fluid in the pipe is gas (d) fluid is highly viscous
155. For a given cross sectional area, the most economical channel section has maximum
(a) velocity of fluid (b) discharge
(c) depth of fluid flowing (d) wetted perimeter
156. The coefficient of discharge (C_d) of an orifice varies with
(a) Reynold's number (b) Weber number
(c) Froud number (d) Mach number

135. Steady state flow occurs when
(a) pressure does not change along the flow
(b) velocity does not change
(c) flow conditions change slowly with time
(d) flow conditions remain unchanged with time at any point
136. Cavitation in hydro-machineries is caused by
(a) high velocity (b) low barometric pressure
(c) high pressure (d) low pressure
137. The fluid forces considered in the Navier Stokes equation are
(a) gravity, pressure and viscous (b) gravity, pressure and turbulent
(c) pressure, viscous and turbulent (d) gravity, viscous and turbulent
138. For measuring flow by a venturimeter in a pipe, it should be installed in
(a) vertical line (b) horizontal line
(c) inclined line with upward flow (d) in any direction and in any location
139. A large value of Reynold's number is indication of
(a) smooth and stream line flow (b) laminar flow
(c) steady flow (d) highly turbulent flow
140. In laminar flow, maximum velocity at the centre of pipe is greater than the average velocity by
(a) two times (b) three times
(c) four times (d) none of these
141. The friction resistance in pipe is proportional to the square of velocity, it is according to
(a) Froud number (b) Reynold's number
(c) Prandtl number (d) Weber-Froud number
142. Total pressure on a gate with dimension 1m×1m when immersed vertically at a depth of 2m below the free water surface will be
(a) 1000Kg (b) 2000Kg
(c) 4000Kg (d) 8000Kg
143. In steady flow of a fluid, the acceleration of any fluid particle is
(a) constant (b) variable
(c) zero (d) none of these
144. A piece of wood having weight 5 Kg floats in water with 60% of its volume under the liquid. The specific gravity of wood is
(a) 0.83 (b) 0.60
(c) 0.40 (d) 0.90
145. The magnitude of water hammer depends on the
(a) length of pipeline
(b) speed at which the valve is closed
(c) elastic properties of the fluid and pipe material
(d) all the above

63. For a heat engine operating on Carnot cycle, the work output is $\frac{1}{4}$ th of the heat transferred to the cold system. The efficiency of the engine is
(a) 20% (b) 25%
(c) 75% (d) 80%
64. A Carnot engine receiving heat at 400°K has an efficiency of 25%. The C.O.P. of a Carnot refrigerator working between the same temperature limit is
(a) 1 (b) 2
(c) 3 (d) 4
65. The loss of available energy associated with the transfer of 1000KJ of heat from a constant temperature system at 600K to another at 400 K when the environmental temperature is 300K is
(a) 166.67KJ (b) 250KJ
(c) 500KJ (d) 750KJ
66. 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) 3.33 (b) 3.00
(c) 2.33 (d) 1.33
67. One kilogram of an ideal gas is throttled from an initial pressure of 0.5MPa to 0.1MPa. If initial temperature is 300K then entropy change of the universe is
(a) 1 3.38KJ/K (b) 40.3KJ/K
(c) 0.0446KJ/K (d) -0.0446KJ/k
68. For reversible adiabatic compression in a steady flow process, the work transfer per unit mass 0 is given by the expression
(a) $\int p dv$ (b) $\int v dp$
(c) $\int T ds$ (d) $\int s dT$
69. The specific heats of an ideal gas depend on its
(a) temperature (b) pressure
(c) volume (d) molecular weight
70. For a given set of operating pressure limits of a Rankine cycle, the highest efficiency occurs for
(a) saturated cycle (b) superheated cycle
(c) reheat cycle (d) regenerative cycle
71. A 10 Kg solid at 100° C with a specific heat of 0.8 KJ/Kg-°C is immersed in 40 Kg of 20°C liquid with a specific heat of 4.0 KJ/Kg-°C. The temperature after a long time if the container is insulated will be
(a) 30°C (b) 28°C
(c) 26°C (d) 24°C
72. The wave length of radiation emitted by a body depends upon
(a) the nature of its surface (b) the area of its surface
(c) the temperature of its surface (d) all the above factors

73. The ratio of energy transferred by convection to that by conduction is called
(a) Stanton number (b) Nusselt number
(c) Biot number (d) Peclet number
74. Free convection does not depend on the factor out of given below and it is
(a) density (b) coefficient of viscosity
(c) gravitational force (d) velocity
75. In a parallel flow gas turbine recuperator, the maximum efficiency is
(a) 100% (b) 75%
(c) 50% (d) between 25% and 45%
76. Provision of fins on a given heat transfer surface will be more if there are
(a) fewer number of thin fins (b) fewer number of thick fins
(c) large number of thin fins (d) large number of thick fins
77. In free convection heat transfer transition from laminar to turbulent flow is governed by the critical value of the
(a) Reynold's number (b) Grashoff's number
(c) Prandtl number (d) Grashoff's number and Prandtl number
78. For evaporators and condensers, for the given conditions, the logarithmic mean temperature difference (LMTD) for parallel flow is
(a) equal to that for counter flow
(b) greater than that for counter flow
(c) smaller than that for counter flow
(d) very much smaller than that for counter flow
79. The thickness of thermal and hydrodynamic boundary layer is equal when
(a) Prandtl number = 1 (b) Prandtl number > 1
(c) Prandtl number < 1 (d) Prandtl number = Nusselt number
80. In a shell and tube heat exchanger, baffles are provided on the shell side to
(a) prevent the stagnation of shell side fluid (b) improve heat transfer
(c) provide support to tube (d) all of the above
81. In a counter flow heat exchanger, cold fluid enters at 30°C and leaves at 50°C, where as the hot fluid enters at 150°C and leaves at 130°C. The mean temperature difference for this case is
(a) 50°C (b) 20°C
(c) 80°C (d) 100°C
82. Heat pipe is widely used today because it acts as
(a) an insulator (b) conductor and insulator
(c) a superconductor (d) a fin
83. Heat transfer takes place according to
(a) Zeroth law of thermodynamics (b) First law of thermodynamics
(c) Second law of thermodynamics (d) Third law of thermodynamics

125. Three metal walls of the same cross sectional area having thermal conductivities in the ratio 1:2:4 transfer heat at the rate of 6000 KJ/hr. For the same wall thickness, the temperature drops will be in the ratio
(a) 1: 2: 4 (b) 1: 1/2: 1/4
(c) 1/4: 1/2: 1 (d) 1: 1: 1
126. An exchanger in which hot and cold fluids flow over heat transfer surface alternately is
(a) direct contact exchanger (b) regenerator
(c) parallel flow exchanger (d) all of these
127. Up to the critical radius of insulation
(a) added insulation will increase heat loss
(b) added insulation will decrease heat loss
(c) convection heat loss will be less than conduction heat loss
(d) heat flux will decrease
128. The outer surface of a long cylinder is maintained at constant temperature. The cylinder does not have any heat source. The temperature in the cylinder will
(a) increase linearly with radius (b) decrease linearly with radius
(c) remain unaffected of radius (d) change logarithmically with radius
129. A rotameter is a device used to measured
(a) velocity of fluid in pipes (b) velocity of gauges
(c) vortex flow (d) flow of fluids
130. With the rise of temperature, dynamic viscosity of most of the gases
(a) increases (b) decreases
(c) remains unaffected (d) none of the above
131. Length of mercury column at a place at an altitude will vary with respect to that at ground level
(a) in a linear relation (b) in a hyperbolic relation
(c) in a parabolic relation (d) in a manner first slowly and then steeply
132. Reynold's number for pipe flow is expressed as
(a) $\frac{\gamma D}{\nu}$ (b) $\frac{\gamma D \mu}{\nu}$
(c) $\frac{\rho \nu D}{\mu}$ (d) $\frac{\nu D}{\mu}$
133. The flow of water in a pipe of diameter 3000mm can be measured by
(a) Venturimeter (b) Rotameter
(c) Pitot tube (d) Orifice plate
134. Which of the following is a dimensionless parameter?
(a) Pressure coefficient (b) Froude number
(c) Darcy Weisbach friction factor (d) none of the above

- 116.** All bodies above absolute zero temperature emit radiation is defined in
 (a) Wein's law (b) Stefan's law
 (c) Planck's law (d) Prevost theory
- 117.** Stefan-Boltzman equation written as
 (a) $Q=\rho AT$ (b) $Q=\rho AT^2$
 (c) $Q=\rho AT^3$ (d) $Q=\rho AT^4$
- 118.** Air at 20°C blows over a plate of 50cm×75cm maintained at 250°C. If the convection heat transfer coefficient is 25W/m² -⁰C, the heat transfer rate is
 (a) 215.6kW (b) 2156kW
 (c) 2.156kW (d) 21.56kW
- 119.** For steady flow and constant value of conductivity, the temperature distribution for a plane wall is
 (a) parabolic (b) linear
 (c) logarithmic (d) cubic
- 120.** The thermal conductivity in S.I. unit is expressed as
 (a) J/m² K (b) W/m K
 (c) W/m K sec (d) W/m²
- 121.** In free convection, motion of fluid is caused by
 (a) by the weight of the fluid elements
 (b) by the hydrostatic force on the element
 (c) by the buoyancy force arising from variation in density of the fluid with temperature
 (d) none of the above
- 122.** Fin coefficient deals with
 (a) thermal performance (b) economical material requirement
 (c) cost of manufacturing (d) all of the above
- 123.** The overall heat transfer coefficient (U) for a composite wall of thicknesses x_1, x_2, x_3 and corresponding thermal conductivities k_1, k_2, k_3 is given by
 (a) $\frac{1}{U} = \frac{k_1}{x_1} + \frac{k_2}{x_2} + \frac{k_3}{x_3}$ (b) $U = \frac{k_1}{x_1} + \frac{k_2}{x_2} + \frac{k_3}{x_3}$
 (c) $\frac{1}{U} = \frac{x_1}{k_1} + \frac{x_2}{k_2} + \frac{x_3}{k_3}$ (d) $U = \frac{x_1}{k_1} + \frac{x_2}{k_2} + \frac{x_3}{k_3}$
- 124.** In a furnace the wall thickness, width and height are 0.6m, 1m and 1.5m respectively. The thermal conductivity of the material is 0.4W/mK. The temperature inside and outside the furnace are 1000°C and 4°C respectively. The thermal resistance is
 (a) 1k/W (b) 2k/W
 (c) 18k/W (d) 15k/W

- 84.** In a long cylindrical rod of radius R and a surface heat flux of q_0 , the uniform internal heat generation rate is
 (a) $2q_0/R$ (b) $2q_0$
 (c) q_0/R (d) q_0/R^2
- 85.** Heat is mainly transferred by conduction, convection and radiation in
 (a) insulated pipes carrying hot water (b) refrigerator freezer coil
 (c) boiler furnaces (d) condensation of steam in condenser
- 86.** For a given heat flow and for the same thickness, the temperature drop across the material will be maximum for
 (a) copper (b) steel
 (c) glass wool (d) refractory brick
- 87.** In a pulverized fuel fired large power boiler, heat transfer from the burning fuel to the walls of the furnace is
 (a) by conduction only (b) by convection only
 (c) by conduction and convection (d) predominantly by radiation
- 88.** When the thickness of insulation on a pipe exceeds the critical value, the heat transfer rate
 (a) increases (b) decreases
 (c) unaffected (d) none of these
- 89.** Temperatures near absolute zero are obtained by using
 (a) Peltier effect (b) Thermionic emission
 (c) Azeotropes (d) Magnetic cooling
- 90.** Critical thickness of insulation for spheres is given by
 (a) k/h (b) $k/2\pi h$
 (c) $h/2k$ (d) $2k/h$
- 91.** The temperature measuring device having least accuracy is
 (a) clinical thermometer (b) alcohol filled thermometer
 (c) optical pyrometer (d) nitrogen filled thermometer
- 92.** The surface having least emissivity is
 (a) smooth glass (b) plaster
 (c) aluminium foil (d) concrete
- 93.** The specific heat of mango juice is 5.8KJ/Kg-⁰C. Heat that must be removed to cool 3.0Kg of mango juice from 30°C to 0°C is
 (a) 24KJ (b) 38KJ
 (c) 340KJ (d) 600KJ
- 94.** The process of heat transfer from one particle of the body to another without the actual motion of the particle is known as
 (a) conduction (b) convection
 (c) radiation (d) all of the above

95. Basic law of heat conduction is
(a) Fourier's law (b) Newton's law
(c) Stefan's law (d) Joule's law
96. Metals are good heat conductors because of
(a) free electrons present (b) their atoms are relatively far apart
(c) their atoms collide frequently (d) all of the above
97. If thermal conductivity of a material of certain wall varies as $K_0(1+\alpha t)$, then the temperature at the centre of the wall as compared to that in case of constant thermal conductivity, will be
(a) more (b) less
(c) same (d) depends on other factors
98. With the increase of temperature, thermal conductivity of solid metals
(a) increases (b) decreases
(c) remains same (d) depends on other factors
99. With the increase of temperature, thermal conductivity of water
(a) increases
(b) decreases
(c) remains same
(d) may increase or decrease depending on temperature
100. With the increase of temperature, thermal conductivity of air
(a) increases (b) decreases
(c) remains same (d) none of the above
101. Which one of the following is having highest thermal conductivity?
(a) air (b) water
(c) oxygen (d) hydrogen
102. Which one of the following is having highest thermal conductivity?
(a) solid ice (b) melting ice
(c) water (d) steam
103. If ρ is density of substance, S is specific heat and k is thermal conductivity, then thermal diffusivity is equal to
(a) $S/\rho.k$ (b) $\rho.k/S$
(c) $k/\rho.S$ (d) $\rho.S/k$
104. Unit of thermal diffusivity is
(a) $m/hr. ^\circ C$ (b) m^2/hr
(c) m/hr (d) $m^2/hr. ^\circ C$

105. Mean radius of a hollow sphere of inner and outer radii R_1 and R_2 for same heat transfer is equal to
(a) $\frac{R_1 + R_2}{2}$ (b) $\sqrt{R_1.R_2}$
(c) $R_1.R_2$ (d) $\frac{R_1.R_2}{2}$
106. Film coefficient is the ratio of
(a) thickness of film of fluid to thermal conductivity
(b) thickness of film of fluid to temperature drop through film of fluid
(c) thermal conductivity to temperature drop through film of fluid
(d) thermal conductivity to equivalent thickness of film of fluid
107. Heat exchangers are used in
(a) condensers and boilers in steam plant (b) radiators
(c) intercoolers and pre-heaters (d) all of the above
108. Absorptivity and reflectivity of a white body respectively are
(a) 0 and 0 (b) 1 and 0
(c) 0 and 1 (d) 1 and 1
109. Automobile radiator is an heat exchanger of the following type
(a) counter flow (b) parallel flow
(c) cross flow (d) mixed flow
110. Ratio of kinematic viscosity to thermal diffusivity is known as
(a) Reynold's number (b) Nusselt number
(c) Prandtl number (d) Grashoff number
111. A dimensionless number associated with convective heat transfer is
(a) Reynold's number (b) Nusselt number
(c) Froude number (d) all of the above
112. In natural convection, the Nusselt number is function of
(a) Reynold's number (b) Grashoff's number
(c) Prandtl number (d) both Grashoff and Prandtl number
113. Energy get transferred by means of electromagnet in
(a) conduction process (b) convection process
(c) radiation process (d) none of these
114. If a body reflects all the radiations incident on it, it is called as a
(a) black body (b) white body
(c) grey body (d) opaque body
115. Temperature of sun can be measured with a
(a) mercury thermometer (b) standard thermometer
(c) radiation pyrometer (d) none of the above