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Test Booklet Series

A

T. B. C. : AEM – 2 / 2019

TEST BOOKLET

ASSISTANT EXECUTIVE ENGINEER

MECHANICAL ENGINEERING

PAPER – II

Sl. No. 203529

Time Allowed : 3 Hours

Maximum Marks : 180

: INSTRUCTIONS TO CANDIDATES :

1. IMMEDIATELY AFTER COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET OF SAME SERIES ISSUED TO YOU.
2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D**, AS THE CASE MAY BE, IN THE APPROPRIATE PLACE IN THE ANSWER SHEET USING BALL POINT PEN (BLUE OR BLACK).
3. You have to enter your **Roll No.** on the Test Booklet in the Box provided alongside. **DO NOT** write *anything else* on the Test Booklet.
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5. This Test Booklet contains **180** items (questions). Each item (question) comprises four responses (answers). You have to select the correct response (answer) which you want to mark (darken) on the Answer Sheet. In case, you feel that there is more than one correct response (answer), you should mark (darken) the response (answer) which you consider the best. In any case, choose **ONLY ONE** response (answer) for each item (question).
6. You have to mark (darken) all your responses (answers) **ONLY** on the **separate Answer Sheet** provided by **using BALL POINT PEN (BLUE OR BLACK)**. See instructions in the Answer Sheet.
7. All items (questions) carry equal marks. All items (questions) are compulsory. Your total marks will depend only on the number of correct responses (answers) marked by you in the Answer Sheet. **There will be negative markings for wrong responses (answers).**
8. Before you proceed to mark (darken) in the Answer Sheet the responses (answers) to various items (questions) in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per the instructions sent to you with your **Admission Certificate**.
9. After you have completed filling in all your responses (answers) on the Answer Sheet and after conclusion of the examination, you should hand over to the Invigilator the *Answer Sheet* issued to you. You are allowed to take with you the candidate's copy / second page of the Answer Sheet along with the **Test Booklet**, after completion of the examination, for your reference.
10. Sheets for rough work are appended in the Test Booklet at the end.

SEAL

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1. Which one of the following relations defines Helmholtz function ?

(A) $H + TS$

(B) $H - TS$

(C) $U + TS$

(D) $U - TS$

2. For an ideal gas the comperssibility factor is :

(A) Zero

(B) Unity

(C) Infinity

(D) None of these

3. Which one of the following is the extensive property of the system ?

(A) Volume

(B) Pressure

(C) Temperature

(D) Density

4. An ideal gas of mass 'm' and temperature T_1 undergoes a reversible isothermal process from an initial pressure P_1 to final pressure P_2. The heat loss during the process is Q. The entropy change of the gas is :

(A) $mR\ln(P_2/P_1)$

(B) $mR\ln(P_1/P_2)$

(C) mRT

(D) Zero

5. Heat and Work are :

(A) Path function

(B) Intensive properties

(C) Point function

(D) None of these

6. If a closed system is undergoing an irreversible process, the entropy of the system :

(A) Must decrease

(B) Zero

(C) Must increase

(D) Remain constant

7. A positive value of Joule-Thomson coefficient of a liquid means :

(A) Temperature drops during throttling

(B) Temperature remains constant

(C) Temperatue rises during throttling

(D) None of these

8. For a non-flow constant pressure process the heat exchange is equal to :

(A) Zero

(B) The work done

(C) The change in internal energy

(D) The change in enthalpy

9. What is the rise in temperature of 80 litres of water in 40 min by a heater of 2 kW, if whole of the heater energy used to raise the water temperature ?
   (A) 14.3°C
   (B) 1.43°C
   (C) 2.52°C
   (D) 25.2°C

10. Water vapour can be considered as Ideal Gas.
   (A) Never
   (B) Always
   (C) At high pressure
   (D) At low pressure

11. In van der Waals equation of state the two constant are determined from the behavior of substance at :
   (A) Saturatred point
   (B) Triple point
   (C) Critical point
   (D) Never determined

12. Pressure exerted by a gas in a closed container is :
   (A) Weak function of Density and Temperature
   (B) Weak function of Density and Volume
   (C) Strong function of Density and Temperature
   (D) Strong function of Density and Volume

13. Specific heat of monatomic gases :
   (A) Increase with temperature rise
   (B) Decrease with temperature rise
   (C) Does not depends on change in Temperature
   (D) None of these

14. The gauge pressure in a truck tire before and after the journey was recorded as 200 kPa and 220 kPa respectively at the location where atmospheric pressure and temperature was 100 kPa and 27°C respectively. How much the rise in temperature of tire air after trip ?
   (A) 20°C
   (B) 27°C
   (C) 47°C
   (D) Insufficient data

15. In a reciprocating air compressor, the compression work per kg of air :
   (A) Increases as clearance volume increases
   (B) Decreases as clearance volume increases
   (C) Independent of clearance volume
   (D) Increases as clearance volume decreases

16. Reference fuel for Cetane rating are :
(A) Cetane and Iso-octane
(B) Iso-octane and n-heptane
(C) Cetane and n-heptane
(D) Cetane and α-methyl naphthalene

17. In carburetors the meter rod economizer is used to supply air fuel mixture during :
(A) Cold starting
(B) Acceleration
(C) Ideling
(D) Power enrichment

18. The effect of dissociation in combustion process is for :
(A) Separating the product of combustion
(B) Reducing the flame temperature
(C) Reducing the use of excess air
(D) Reducing CO_2 percentage in the gas

19. The problem of engine that can be reduces with the rise in front end volatility of fuel :
(A) Cold starting
(B) Vapour lock
(C) Hot starting
(D) Spark plug fouling

20. Which is not the correct option for fuel injection system of petrol engine ?
(A) Increase in power
(B) Improve distribution of the mixture
(C) Reduce volumetric efficiency
(D) Reduce mixture temperature in the cylinder

21. What does the composition of dry gas CO_2 = 104%, O_2 = 9.6%, N_2 = 80% indicates ?
(A) Air is just sufficient
(B) Excess air is used
(C) Air is insufficient
(D) Hydrogen is not present in the fuel

22. Which option is not correct for I head combustion chamber for SI engine ?
(A) Higher volumetric efficiency
(B) Lower pumping losses
(C) Higher surface to volume ratio
(D) Less knocking

23. The volume of charge that can be available in an engine after suction, if the clearance volume is 20 cm and swept volume is 300 cm. Consider mechanical efficiency and volumetric efficiency of engine as 90% and 80% respectively :
(A) 288 cc
(B) 270 cc
(C) 256 cc
(D) 240 cc

24. The indicated mean effective pressure for four stroke single cylinder engine that produces 24 kW of power at engine crank shaft, at 2000 rpm, having mechanical efficiency as 80%. Consider engine swept volume as 900 cc and stroke length as 9 cm :

(A) 0.33 bar

(B) 10 bar

(C) 20 bar

(D) 0.167 bar

25. During distillation process which fuel vaporise in the end ?

(A) Kerosene

(B) Aviation fuel

(C) Diesel

(D) Petrol

26. The theoretical A/F ratio on mole basis for combustion of Octane will be :

(A) 59

(B) 59.5

(C) 60

(D) Insufficient data

27. Which is the best option to avoid knock in SI engine ?

(A) Supercharging of Engine

(B) Delay period should low

(C) Delay period should high

(D) Spark should be advanced

28. Which design of the combustion chamber has less problem in cold starting ?

(A) M Combustion Chamber

(B) Open Combustion Chamber

(C) Air-cell Combustion Chamber

(D) Any design of Combustion Chamber

29. Which device can be used to measure aromatic hydrocarbon in exhaust gas ?

(A) Dispersion analyzer

(B) Non-dispersive infrared analyser

(C) Flame ionization detector

(D) All of these

30. Which method can be applicable to measure FHP only for single cylinder CI engine ?

(A) Morse test

(B) Willian's line method

(C) Both can be used

(D) None of these

31. Which type of nozzle is preferred to avoid weak injection and dribbling of fuel in combustion chamber ?

(A) Single hole

(B) Multihole

(C) Pintle

(D) Pintaux

32. The No_x level in exhaust gas can be reduced by the following method :
(A) Thermal reactor
(B) After burner
(C) Advance spark timing
(D) Exhaust gas recirculation

33. With increase in Air fuel ratio the level of HCs in exhaust gas :
(A) Increased
(B) Reduces
(C) Initially increases till chemically corrected ratio than reduces
(D) Initially reduces till chemically corrected ratio than increases

34. For same output the specific fuel consumption of petrol engine as compared to diesel engine is :
(A) Higher
(B) Lower
(C) Same
(D) None of these

35. Which device is used in SI engine to develop high voltage for spark ?
(A) Battery
(B) Distributor
(C) Ignition coil
(D) Spark plug

36. The effect of Iso-octane content in fuel for SI engine on auto ignition is :
(A) Accelerate
(B) Retard
(C) Does not affect
(D) Initially increases then reduces

37. The air fuel mixture required by a petrol engine during Idling condition :
(A) Rich
(B) Lean
(C) Chemically corrected ratio
(D) Depend on engine size

38. The spark advance is specified in :
(A) Time in seconds
(B) Degree of crank rotation
(C) Percentage of engine speed in rpm
(D) None of these

39. The compression ratio of diesel engine as compared to expansion ratio is :
(A) Low
(B) Same
(C) High
(D) Depend on engine size

40. Supercharging is usually not suggested for a petrol engine due to :
(A) Decrease in volumetric efficiency
(B) Increase in specific fuel consumption
(C) Increase in power loss
(D) Increase in knocking

41. 4 stroke engine as compared to 2 stroke engine has :
(A) Lower volumetric efficiency
(B) Higher fuel consumption
(C) Smaller size of flywheel
(D) Bigger size of engine for same output

42. Which property is related to Alcohol ?
(A) Lower vapour pressure
(B) Higher cetane number
(C) Smaller octane number
(D) Good lubricating quality

43. Which property is not related with LPG as fuel for automotive applications ?
(A) Lower knock resistance
(B) Lower crank case dilution
(C) Lower volumetric efficiency
(D) Lesser residue and oil contamination

44. High API gravity of fuel means :
(A) Lower Diesel Index
(B) Lower Brake specific fuel consumption
(C) Lower heat of combustion
(D) Lower ignition quality

45. Calorific value of fuel obtained by using Bomb Calorimeter is :
(A) Constant Volume Lower Calorific Value
(B) Constant Volume Higher Calorific Value
(C) Constant Pressure Lower Calorific Value
(D) Constant Pressure Higher Calorific Value

46. A heat pump working on a reversed Carnot cycle has a C.O.P. of 5. It works as a refrigerator taking 1 kW of work input. The refrigerating effect will be :
(A) 4 kW
(B) 1 kW
(C) 2 kW
(D) 5 kW

47. When the lower temperature of a refrigerating machine is fixed, then the coefficient of performance can be improved by :
(A) Operating the machine at higher speeds
(B) Operating the machine at lower speeds
(C) Raising the higher temperature
(D) Lowering the higher temperature

48. The C.O.P. of a Carnot refrigerator in winter as compared to in summer will be :
(A) Large
(B) Small
(C) Unpredictable
(D) Same

49. The COP of a vapour compression plant in comparison to vapour absorption plant is :
(A) Large
(B) Small
(C) Same
(D) More or less depends on size of plant

50. In aqua-ammonia and lithium-bromide water absorption refrigeration systems, the refrigerants are respectively :
(A) Ammonia and water
(B) Water and water
(C) Water and lithium bromide
(D) Ammonia and lithium bromide

51. Which of the following statement is wrong ?
(A) The performance of the vapour compression refrigerator varies considerably with both vaporising and condensing temperatures.
(B) In vapour compression cycle, the useful part of the heat transfer is at the condenser.
(C) In ammonia-hydrogen (Electrolux) refrigerator, no compressor, pump or fan is required.
(D) The effect of under-cooling the liquid refrigerant is to decrease the coefficient of performance

52. The coefficient of performance of a refrigerator as compared to air-conditioner is :
(A) Large
(B) Small
(C) Same
(D) More or less depends on size of plant

53. The domestic refrigerator uses the following type of compressor :
(A) Centrifugal
(B) Axial
(C) Reciprocating
(D) Screw

54. Thermostatic expansion valve works on the change of :
(A) Temperature of evaporator
(B) Pressure of evaporator
(C) Degree of superheat at evaporator exit
(D) Temperature of condenser

55. The centrifugal compressors are generally used for refrigerants that require :
(A) Small displacements and low condensing pressures
(B) Large displacements and high condensing pressures
(C) Small displacements and high condensing pressures
(D) Large displacements and low condensing pressures

56. Which of the following refrigerant has the maximum ozone depletion potential in the stratosphere ?

(A) Fluorine

(B) Carbon dioxide

(C) Ammonia

(D) Hydrocarbon

57. The leaks in a refrigeration system using Freon are detected by :

(A) Halide torch which on detection produces greenish flame lighting

(B) Sulphur sticks which on detection gives white smoke

(C) Smelling

(D) None of these

58. A refrigerant should have :

(A) Low specific heat of liquid

(B) High boiling point

(C) High latent heat of vaporisation

(D) Higher critical temperature

59. In a vapour-compression refrigeration system before entering into the throttle valve the refrigerant is in the form of :

(A) Superheated vapour

(B) Wet vapour

(C) High pressure saturated liquid

(D) High pressure dry vapour

60. Which parameter remains constant during throttling process ?

(A) Entropy

(B) Pressure

(C) Enthalpy

(D) Volume

61. When the outside air is introduced for ventilation purposes there is a :

(A) Sensible heat gain

(B) Latent heat gain

(C) Sensible and latent heat gain

(D) No heat gain

62. The difference between dry bulb temperature and wet bulb temperature is called :

(A) Dry bulb depression

(B) Wet bulb depression

(C) Dew point depression

(D) Degree of saturation

63. In a psychometric process, the sensible heat added is 30 kJ/s and the latent heat added is 20 kJ/s. The sensible heat factor for the process will be ?

(A) 0.30

(B) 0.60

(C) 0.67

(D) 1.50

64. The minimum temperature to which water can be cooled in a cooling tower is :

(A) Dew point temperature of air

(B) Wet bulb temperature of air

(C) Dry bulb temperature of air

(D) Ambient air temperature

65. The atmospheric air at dry bulb temperature of 15°C enters a heating coil maintained at 40°C. The air leaves the heating coil at 25°C. The bypass factor of heating coil is :

(A) 0.376

(B) 0.40

(C) 0.60

(D) 0.67

66. Dew point temperature is the temperature at which codensation begins when the air is cooled at constant :

(A) Temperature

(B) Entropy

(C) Pressure

(D) Enthalpy and Volume

67. Amount of moisture that air can hold increases by :

(A) Decreasing both Saturation Pressure and Temperature

(B) Decreasing Saturation Pressure and Increasing Temperature

(C) Increasing Saturation Pressure and Decreasing Temperature

(D) Increasing both Saturation Pressure and Temperature

68. When Dry bulb, Wet bulb and Dew point temperature can equal ?

(A) RH = 0

(B) RH = 0.50

(C) RH = 1.00

(D) Never Possible

69. Specific humidity of moist air can be defined as ratio of :

(A) Mass of water vapour to mass of moist air

(B) Mass of water vapour to mass of dry air

(C) Mass of water vapour to mass of water vapour at saturated condition

(D) Partial pressure of water vapour to atmospheric pressure

70. During sensible heating specific humidity and Relative humidity of air :

(A) Both remains unchanged

(B) Specific humidity decreases and Relative humidity remains constant

(C) Specific humidity constant and Relative humidity decreases

(D) Both decreases

71. In air conditioning design heat load for an average adult male during idle condition can be considered as :

(A) 75 W

(B) 115 W

(C) 175 W

(D) 215 W

72. Sensible heat factor for an auditorium is generally kept as :

(A) 0.5

(B) 0.7

(C) 0.9

(D) 1.0

73. The supply air state to the conditioned space from cooling coil with a bypass factor lies at :

(A) Intersection of RSHF line with saturation curve

(B) Intersection of GSHF line with saturation curve

(C) Point divides RSHF line in proportion of BPF and (1 – BPF)

(D) Intersection of RSHF line with GSHF line

74. For comfort condition the effective temperature for child as compared to adult is :

(A) Same

(B) Higher

(C) Lower

(D) Insufficient data

75. If 1 kg of air having specific humidity as 0.03 kg/kg of dry air mixes with 2 kg air of specific humidity as 0.015 kg/kg of dry air, the specific humidity of mixture in kg/kg of dry air will be :

(A) 0.025

(B) 0.015

(C) 0.02

(D) Cannot determined

76. The critical radius is the insulation radius at which the resistance to heat flow is :

(A) Maximum

(B) Minimum

(C) Zero

(D) No relation

77. Which of the following is a case of steady state heat transfer ?

(A) I. C. engine

(B) Air preheaters

(C) Heating of building in winter

(D) None of these

78. The concept of overall coefficient of heat transfer is used in heat transfer problems of :

(A) Fin Conduction

(B) Convection

(C) Radiation

(D) Conduction and convection

79. What is the effect of thermal conductivity k on fin effectiveness ?

(A) Fin is effective for smaller value of thermal conductivity

(B) Fin is effective for larger value of thermal conductivity

(C) Thermal conductivity does not affect fin effectiveness

(D) Initially increases and after attaining peak reduces

80. In the process of heat transfer through fins, the entire surface area is at :

(A) Same constant temperature

(B) Different temperatures

(C) Maximum base temperature

(D) Minimum temperature

81. For effective working of fins, the thickness of the fins should be :

(A) Large

(B) Small

(C) Unpredictable

(D) Thickness of fin doesn't affect fin effectiveness

82. Fouling factor is used :

(A) In heat exchanger design as a safety factor

(B) In case of Newtonian fluids

(C) When a liquid exchanges heat with a gas

(D) None of these

83. At the centre of hollow sphere (Surface 1) of 2 m diameter a solid cylinder of 1m diameter and length each is placed (Surface 2), what will be the view factor F_{11} ?

(A) 0.375

(B) 1

(C) 0.625

(D) 0.75

84. The ratio of the thickness of thermal boundary layer to the thickness of hydrodynamic boundary layer is equal to (Prandtl number) n, where n is equal to :

(A) – 1/3

(B) – 2/3

(C) 1

(D) – 1

85. A designer chooses the values of fluid flow rates and specific heats in such a manner that the heat capacities of the two fluids are equal. A hot fluid enters the counter flow heat exchanger at 100°C and leaves at 60° C. A cold fluid enters the heat exchanger at 40°C. The mean temperature difference between the two fluids is :

(A) 30°C

(B) 20°C

(C) 40°C

(D) 60°C

86. For evaporation and condensation in a heat exchanger, the required surface area will be minimum for which type of flow ?

(A) Cross

(B) Counter

(C) Parallel

(D) Same for all the cases

87. In free convection heat transfer transition from laminar to turbulent flow is governed by the critical value of the :

(A) Reynold's number

(B) Grashof's number

(C) Reynold's number and Grashof's number

(D) Prandtl number and Grashof's number

88. Two long parallel surfaces each of emissivity 0.7 are maintained at different temperatures and accordingly have radiation heat exchange between them. It is desired to reduce 75% of the radiant heat transfer by inserting thin parallel shields of emissivity 1 on both sides. The number of shields should be :

(A) 2

(B) 1

(C) 3

(D) 4

89. The value of the wave length for maximum emissive power is given by :

(A) Kirchhoff's Law

(B) Stefan's Law

(C) Wine's Law

(D) Planck's Law

90. The rate of energy emission from unit surface area through unit solid angle, along a normal to the surface, is known as :

(A) Emissivity

(B) Transmissivity

(C) Reflectivity

(D) Intensity of radiation

91. Which of the following is TRUE for stable equilibrium of a floating body ?

(A) Metacentre should be below centre of gravity

(B) Metacentre should be above centre of gravity

(C) Metacentre and centre of gravity must concise

(D) None of these

92. For a Newtonian fluid :

(A) Shear stress is proportional to acceleration

(B) Rate of shear stress is proportional to shear strain

(C) Shear stress is proportional to density

(D) Shear stress is proportional to rate of shear strain

93. The unit of Chezy's constant 'C' in the Chezy's formula is :
(A) m/s
(B) m/s^2
(C) m^2/s^2
(D) $m^{1/2}/s$

94. For flow through pipes, the maximum transmission efficiency that can achieve is :
(A) 97%
(B) 57%
(C) 47%
(D) 67%

95. For a viscous flow, the relation between the coefficient of friction 'f' and Reynold's number 'Re' is :
(A) f = 64/Re
(B) f = 16/Re
(C) f = 8/Re
(D) f = 4/Re

96. Pirani gauge is used for the measurement of :
(A) Very high pressure
(B) High vacuum
(C) Liquid level under pressure
(D) Liquid level at atmospheric pressure

97. A nozzle has 100 m velocity head at outlet. What height will be reached by fluid stream if the nozzle is kept vertical ?
(A) 100 m
(B) 10 m
(C) 141 m
(D) Data insufficient

98. Which of the condition leads to Carvitation Process ?
(A) Too low local temperature
(B) Very high local pressure
(C) Local pressure falls below vapour pressure
(D) Thoma cavitation factor is higher than safe limit

99. Which is the correct option for Froude number ?
(A) Viscous Force
(B) Elastic Force
(C) Gravity Force
(D) Surface tension force

100. The region inside the Mach cone is called :
(A) Zone of action
(B) Zone of silence
(C) Control volume
(D) None of these

101. At critical pressure ratio, the velocity at the throat of a nozzle is :
(A) Equal to the sonic speed
(B) Less than the sonic speed
(C) More than the sonic speed
(D) None of these

102. In a supersonic flow, a diffuser is a conduit having :
(A) Constant area throughout its length
(B) Converging-diverging passage
(C) Gradually decreasing area
(D) Diverging-converging passage

103. The sonic velocity in a fluid medium is directly proportional to :
(A) Mach number
(B) Pressure
(C) Temperature
(D) Square root of temperature

104. The coefficient of discharge for orifice meter as compared to coefficient of discharge for Venturimeter is :
(A) Equal
(B) Very High
(C) Very Small
(D) High

105. Dynamic similarity means the ratio of :
(A) Linear dimension between model and prototype is equal
(B) Velocity between model and prototype at certain point is equal
(C) Forces between model and prototype is equal
(D) All of these

106. Weber number deals with :
(A) Inertial Force and Pressure Force
(B) Inertial Force and Surface Tension Force
(C) Inertial Force and Elactic Force
(D) Inertial Force and Gravitational Force

107. Problems of fluid flow from an orifice or nozzle can be solved by :
(A) Froude Model
(B) Mach Model
(C) Euler Model
(D) Weber Model

108. Which statement is correct for outside regime of the boundry layer of fluid flow ?
(A) Velocity is zero
(B) Shear stress is zero
(C) Velocity is not constant
(D) Shear stress is proportional to velocity gradient

109. The most economic section of channel has :
(A) Minimum Wetted Perimeter
(B) Minimum Discharge
(C) Both Wetted Perimeter and Discharge Minimum
(D) Both Wetted Perimeter and Discharge Maximum

110. The flow in open channel remains laminar if Reynold's number is less than :
(A) 5000
(B) 4000
(C) 2000
(D) 500

111. The power transmission through nozzle is maximum if the ratio of total head supplied and head loss due to friction is :
(A) 1
(B) 1.5
(C) 2
(D) 3

112. The stream line is a line :
(A) On which tangent draw at any given point gives the direction of velocity
(B) Which is always parallel to the main direction of flow
(C) Across which there is no flow
(D) Which is along the path of a particle

113. At given instant the flow parameters remains same at every point for :
(A) Laminar flow
(B) Uniform flow
(C) Steady state flow
(D) Quasi state flow

114. The bulk modulus of elasticity with rise in pressure :
(A) Decreases
(B) Increases
(C) Decreases first and after certain limit increases
(D) Remains constant

115. The buoyancy depends on :
(A) Depth of immersion
(B) Mass of liquid displaced
(C) Pressure of liquid displaced
(D) Viscosity of liquid displaced

116. Centre of pressure on an inclined plane is :
(A) At Metacentre
(B) At Centre of gravity
(C) Below Centre of gravity
(D) Above Centre of gravity

117. A Streamline is defined as :
(A) Line parallel to outer surface of pipe
(B) Line parallel to central axis of flow
(C) Line along which pressure drop is uniform
(D) Line of equal velocity in a flow

118. The region between the boundary surface of the solid body and the separation streamline is :
(A) Crest
(B) Wake
(C) Boundary Layer
(D) Nappe

119. In which type of flow the stream function satisfies the Laplace equation ?
(A) Rotational Flow Crest
(B) Irrotational Flow
(C) Circular Flow
(D) Never Possible

120. In Navier-Stokes equation the considered fluid forces are :
(A) Gravity, Pressure, Turbulent
(B) Viscous, Pressure, Elastic
(C) Gravity, Pressure, Elastic
(D) Gravity, Pressure, Viscous

121. What will be the drag force on an object, if object speed doubled in fluid ?
(A) Doubled
(B) Four times
(C) Remains same
(D) Becomes zero

122. The radial component of velocity everywhere in a free vortex motion is :

(A) Non-zero and finite

(B) Zero

(C) Maximum

(D) Minimum

123. For supersonic flow, if the area of flow increases then :

(A) Velocity remains constant

(B) Velocity increases

(C) Velocity decreases

(D) Velocity initially increases and after attaining peak decreases

124. Discharge through rectangle channel is maximum when the ratio of hydraulic mean depth and depth of flow is :

(A) 0.5

(B) 1.0

(C) 1.5

(D) 2.0

125. Cipolletti weir is a trapezoidal weir having side slope of :

(A) 1 horizontal 4 vertical

(B) 4 horizontal 1 vertical

(C) 1 horizontal 2 vertical

(D) 2 horizontal 1 vertical

126. The thickness of turbulent boundary layer at distance X from the leading edge over a flat plate varies as :

(A) $x^{4/5}$

(B) $x^{1/5}$

(C) $x^{3/5}$

(D) $x^{1/2}$

127. Separation of boundary layer take place when :

(A) Pressure and Velocity gradient both positive

(B) Pressure and Velocity gradient both negative

(C) Positive pressure gradient and Negative velocity gradient

(D) Negative pressure gradient and Positive velocity gradient

128. The body is called bluff body if the surface of the body :

(A) Very rough

(B) Very smooth

(C) Coincides with streamlines

(D) Does not coincides with streamlines

129. The skin friction drag on a sphere for $Re < 0.2$ is equal to :

(A) Equal to total drag

(B) Two-third of total drag

(C) One-third of total drag

(D) Double of total drag

130. A body weight is 392.4N in air and 196.2N in water, the volume of body in m^3 is :

(A) 0.05

(B) 0.10

(C) 0.02

(D) 0.01

131. The flow through a Venturimeter is proportional to :

(A) $H^{4/5}$

(B) H

(C) $H^{3/2}$

(D) $H^{1/2}$

132. A boundary of a body is considered as hydrodynamically smooth if the ratio of average height of irregularities from the boundary to the thickness of laminar sub layer is :

(A) Equal to 0.3

(B) Equal to 6

(C) Greater than 0.3

(D) Less than 0.25

133. What is the approximate value of coefficient of velocity for sharp edge orifice, if a jet from under constant head of 25 cm have horizontal and vertical coordinate of vena contracta at 18 cm and 4 cm respectively ?

(A) 0.95

(B) 1.00

(C) 0.90

(D) Insufficient data

134. What is the height of mountain if the Barometer pressure at sea level and at mountain is respectively 760 mm and 726 mm of mercury, considering air density as 1.2 kg/m^3 ?

(A) 36 m

(B) 360 m

(C) 410 m

(D) Insufficient data

135. What will be the approximate resultant velocity at point (1, 2), if the stream function for a two dimension flow is given by $\psi = x^3 + y^2$?

(A) 3.0

(B) 5.0

(C) 7.0

(D) None of these

136. The head against which a centrifugal pump has to work is known as :

(A) Static head

(B) Total load

(C) Net positive suction head

(D) Manometric head

137. The head loss due to friction for the flow of water through penstocks can be minimized by :

(A) Decreasing the diameter of penstock

(B) Increasing the diameter of penstock

(C) Increasing the length of penstock

(D) Increasing the velocity of flow

138. The ratio of the pitch diameter of Pelton wheel to the diameter of the jet is called :

(A) Jet ratio

(B) Speed ratio

(C) Wheel ratio

(D) None of these

139. The incorrect option related to Prewhirl of centrifugal compressor :
(A) To maintain the Mach number less than unity at impeller eye tip
(B) To increase the relative velocity at inlet guide vane
(C) To avoid chocking at compressor inlet
(D) None of these

140. The pump suitable for high head low discharge :
(A) Radial flow
(B) Axial flow
(C) Mixed flow
(D) Multi stage

141. Correct option for the specific speed of pump is :
(A) $(N\sqrt{Q})/H^{5/4}$
(B) $(N\sqrt{Q})/H^{3/4}$
(C) $(N\sqrt{P})/H^{3/4}$
(D) $(N\sqrt{P})/H^{5/4}$

142. A Draft tube is used with :
(A) Impulse Turbine
(B) Reaction Turbine
(C) Reciprocating Pump
(D) Centrifugal pump

143. Kaplan Turbine is a :
(A) Impulse turbine
(B) Inward flow reaction
(C) Axial flow reaction
(D) Axial flow reaction with fixed vanes

144. Impeller of two geometrical similar centrifugal pump operates at same speed, how power, discharge and head will vary with diameter ratio, d, respectively as :
(A) d^5, d^3, d^2
(B) d, d^3, d^2
(C) d^5, d^3, d
(D) d^3, d^2, d

145. Which type of power plant is Peak load type ?
(A) Nuclear
(B) Thermal
(C) Hydraulic
(D) Gas

146. The ratio of energy produced by a power plant to the installed capacity of plant is called as :
(A) Load factor
(B) Use factor
(C) Average load factor
(D) Demand factor

147. Draught in a boiler is important for :
(A) Removing combustible gases from boiler
(B) For proper combustion of fuel
(C) Both (A) and (B)
(D) None of these

148. On a boiler one end of the water indicator (Glass Tube Type) is connected to water space in boiler and other end is connected to :
(A) Open to atmosphere
(B) Steam space of boiler
(C) Superheater
(D) Another part of water space

149. A device used to increase the temperature of saturated steam without raising its pressure, is called :
(A) Stop Valve
(B) Economiser
(C) Super Heater
(D) Pre Heater

150. A steam jet issuing from a nozzle placed under the fire grate, in the ash pit of the furnace is used to produce which type of draught ?
(A) Natural
(B) Induced
(C) Forced
(D) None of the options

151. If enthalpy of steam at the entry and exit of steam turbine is respectively 3000 kJ/kg and 2000 kJ/kg, if pump work is ignored, what will be the specific steam consumption ?
(A) 3.60 kg/kW.hr
(B) 3.60 kg/kW.s
(C) 0.360 kg/kW.s
(D) Insufficient data

152. The equivalent evaporation is defined as :
(A) The amount of water evaporated from and at 100°C to dry saturated steam
(B) The amount of water evaporated in kg/kg of fuel burnt
(C) The evaporation of 15.653 kg of water / hour from and at 100°C
(D) The ratio of heat used in producing the steam to the heat liberated in furnace

153. Which of the following is not a boiler accessory ?
(A) Steam stop valve
(B) Blow off cock valve
(C) Feed water pump
(D) Water level indicator

154. In a locomotive and marine boilers the safety valve used are mainly :
(A) Leaver operated safety valve
(B) High steam and low water safety valve
(C) Spring loaded safety valve
(D) Dead weight safety valve

155. In a four stage compressor, if the pressure at the first and third stage are 1 bar and 16 bar, then the delivery pressure at the fourth stage will be :
(A) 1 bar
(B) 16 bar
(C) 64 bar
(D) 256 bar

156. In a centrifugal compressor, an increase in speed at a given pressure ratio causes :
(A) Increase in efficiency
(B) Decrease in flow
(C) Increase in flow
(D) Increase in flow and decrease in efficiency

157. Inter-cooling in gas turbines :
(A) Decreases net output but increases thermal efficiency
(B) Increases net output and thermal efficiency both
(C) Increases net output but decreases thermal efficiency
(D) Decreases net output and thermal efficiency both

158. High air-fuel ratio in gas turbines is used to :
(A) Reduces exhaust temperature
(B) Improves thermal efficiency
(C) Avoid damage of turbine blades
(D) Increases power output

159. A closed cycle gas turbine works on :
(A) Carnot cycle
(B) Ericsson cycle
(C) Joule cycle
(D) Rankine cycle

160. When the outlet angle from the rotor of a centrifugal compressor is more than 90°, then the bladers are said to be ?
(A) Forward curved
(B) Backward curved
(C) Radial
(D) None of these

161. Which one of the following is the correct option for the effect of blade shape on performance of a centrifugal compressor :
(A) Forward curved blades has higher efficiency
(B) Backward curved blades produce higher pressure ratio
(C) Backward curved blades has poor efficiency
(D) Forward curved blades produce higher pressure ratio

162. For an ideal turbine enthalpy of gas at entry and exit is 3,000 kJ/kg and 2,500 kJ/kg respectively and having velocity 200 m/s and 100 m/s respectively at entry and exit. If mass flow rate of gas is 30 kg/s, the approximate power output of turbine is :
(A) 16 MW
(B) 15 MW
(C) 15.5 MW
(D) Insufficient data

163. Which is not the correct method for calculating tariff for electrical energy ?
(A) Hopkinson demand rate
(B) Block meter rate
(C) Three part tariff rate
(D) Incremental demand rate

164. Which of the following changes in maximum T1 and minimum T2 temperature leads to maximum improvement in the efficiency of an ideal turbine ?
(A) $T1 + \Delta T$
(B) $T2 + \Delta T$
(C) $T2 + \Delta T$ and $T1 - \Delta T$
(D) $T1 + \Delta T$ and $T2 - \Delta T$

165. The following is (are) ash handling system(s) :
(A) Hydraulic system
(B) Pneumatic system
(C) Steam jet system
(D) All of these

166. The following is (are) the limitation(s) of gas turbines :
(A) They are not self starting
(B) Higher rotor speeds
(C) Low efficiencies at part loads
(D) All of these

167. Low grade waste heat in bottoming cycle of cogeneration is used for :
(A) Feed water heating
(B) Processing
(C) Power generation
(D) Not for any use

168. The compounding of steam turbine is usually done for :
(A) Reduction of steam consumption
(B) Reduction in turbine size
(C) Reduction of motor speed
(D) Efficiency improvement

169. A throttle governed steam turbine develops 30 IHP by consuming 300 kg/hr steam and 60 IHP with 570 kg/hr. How much steam is required to develop 20 IHP ?
(A) 210 kg/hr
(B) 230 kg/hr
(C) 300 kg/hr
(D) 270 kg/hr

170. In a thermal power plant feed water heater is used to pre heat the feed water by :
(A) Hot gases from boiler furnace
(B) Steam from boiler
(C) Hot air from air pre heater
(D) Turbine exhaust steam

171. Which statement is correct for Parson reaction turbine if $\alpha 1$, $\alpha 2$ inlet and outlet fixed blade angle, $\beta 1$, $\beta 2$ are inlet and outlet moving blade angle ?
(A) $\alpha_1 = \alpha 2, \beta 1 = \beta 2$
(B) $\alpha 1 = \beta 1, \alpha 2 = \beta 2$
(C) $\alpha_1 = \beta 2, \alpha 2 = \beta 1$
(D) $\alpha_1 > \alpha 2, \beta 1 < \beta 2$

172. What will be the degree of reaction of the turbine if the isentropic enthalpy drop is fixed blade in 1.5 time of the isentropic enthalpy drop in the moving blade ?
(A) 0.6
(B) 0.5
(C) 0.4
(D) 0.66

173. For nozzle governed turbine the efficiency is mainly affected due to the losses during :
(A) Throttling
(B) Inter stage pressure drop
(C) Stage condensation
(D) Partial admission

174. The nozzle efficiency of a turbine is :

(A) Ratio of work done on moving blades to actual enthalpy drop

(B) Ratio of work delivered by blades to isentropic enthalpy drop

(C) Ratio of actual to isentropic enthalpy drop

(D) None of these

175. An impulse turbine of single stage having 1.2 m diameter runs at 1000 rpm. What will be the inlet steam velocity if the blade speed ratio is 0.314 ?

(A) 200 m/s

(B) 100 m/s

(C) 150 m/s

(D) 250 m/s

176. When two rotors of the outward radial flow turbine is rotating in opposite direction then it is known as :

(A) Pass out turbine

(B) Ljungstrom turbine

(C) 50% reaction turbine

(D) Condensing turbine

177. What will be the optimum blade speed ratio for compounded impulse turbine with nozzle angle (α) and (n) row of moving blade is :

(A) $2n \cos \alpha$

(B) $\cos \alpha/2n$

(C) $n \cos \alpha/2$

(D) $\cos \alpha/2(n + 1)$

178. The coefficient of velocity for steam turbine is the ratio of :

(A) Relative velocity leaving the blade to the velocity of whirl at inlet of moving blade

(B) Velocity of whirl at inlet of moving blade to the relative velocity leaving the blade

(C) Relative velocity at inlet of moving blade to the relative velocity leaving the blade

(D) Relative velocity leaving the blade to the relative velocity at inlet of moving blade

179. Which is not the property of coolant used in nuclear reactor ?

(A) Must have low boiling point

(B) Must not absorbed neutron

(C) Must be non-oxidising

(D) None of these

180. The combination of fuel and moderator for CANDU reactor is :

(A) Enriched Uranium, Hard water

(B) Natural Uranium, Hard water

(C) Enriched Uranium, Water

(D) Natural Uranium, Water

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