1. Prandtl's hypothesis of a thin boundary layer is
   a) $\frac{\partial p}{\partial y} = 0$    b) $\frac{\partial p}{\partial y} < 0$       c) $\frac{\partial p}{\partial y} > 0$       d) none of these

2. Boundary condition at the boundary layer edge is
   a) $\frac{\partial u}{\partial y} = 0$       b) u=0      c) $\frac{\partial^2 u}{\partial y^2} = 0$       d) none of these

3. Choose the expression for the momentum thickness of an incompressible boundary layer over a flat plate
   a) $\frac{5.0x}{\sqrt{Re_x}}$       b) $\int_0^\delta (1 - \frac{u}{u_e}) dy$      c) $\int_0^\delta \frac{u}{u_e} (1 - \frac{u}{u_e}) dy$       d) $\int_0^\delta \frac{u}{u_e} dy$

4. At the point of separation
   a) Shear stress is zero   b) velocity is negative   c) Pressure gradient is positive  d) Shear stress is maximum

5. At high Reynolds number above 5000, the drag acting on a sphere is primarily due to
   a) Skin friction drag  b) pressure drag  c) induced drag d) interference drag

6. Laminar sub layer is a part of
   a) Laminar boundary layer     b) Turbulent boundary layer c) mixed layer d) free shear layer

7. Diffuser stall at high diffuser angle occurs due to
   a) Thick boundary layer  b) Boundary layer separation  c) Adverse pressure gradient   d) none of these

8. Shear stress at the wall is proportional to
   a) Pressure gradient   b) velocity gradient  c) density gradient  d) none of these

9. Lawn sprinkler is an example of
   a) Water pump       b) reaction turbine      c) impulse turbine      d) none of these

10. The human heart is a good example of a

    a) Positive displacement pump b) Dynamic pump c) Centrifugal pump d) Rotary pump

11. Cup anemometer used to measure wind speed is an example of

a) Dynamic turbines  b) dynamic compressors  c) discharge meters
   d)  none of these

12. For steady, incompressible flow the continuity equation is reduced to

   (a) $div V = 0$ (b) $curl V = 0$ (c) $(V.\nabla)V = 0$ (d) None of these

13. $v dx - u dy = 0$ is the equation of

   (a) Velocity potential b) Stream function  c) streamline  d) Equipotential
      line.

14. Irrotationality condition in a two-dimensional flow is given by

   a)  $\frac{d\Gamma}{dt} = 0$    b) $V.ds = 0$  c)      $\nabla.V = 0$      d) $\frac{\delta v}{\delta x} - \frac{\delta u}{\delta y} = 0$

15. For a circular cylinder placed in a uniform flow, the local velocity over
      the cylinder reaches the freestream value at the following points:
      a) Θ=0 & 90deg   b) Θ=0 & 180 deg c) Θ=30 & 150 deg d) Θ= 90 deg.

16. Stream function $\psi$ exists in two dimensional incompressible flows and it
      can be related to velocity field as

   a) $u = \frac{\partial\psi}{\partial y}; v = -\frac{\partial\psi}{\partial x}$  b) $u = \frac{\partial\psi}{\partial x}; v = \frac{\partial\psi}{\partial y}$  c) $u = \frac{\partial\psi}{\partial x}; v = -\frac{\partial\psi}{\partial y}$  d) $\psi = \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}$

17.  Velocity potential $\phi$ exists in two dimensional incompressible flows and
      the relation between velocity and velocity potential is given by:
      a) $u = \frac{\partial\phi}{\partial y}; v = \frac{\partial\phi}{\partial x}$  b) $u = \frac{\partial\phi}{\partial x}; v = \frac{\partial\phi}{\partial y}$  c) $u = \frac{\partial\phi}{\partial x}; v = -\frac{\partial\phi}{\partial y}$  d) $V = \nabla^2\phi$

18. Starting vortex at the trailing edge is formed due to
      a) Kutta condition b) large velocity gradient c) circulation d) none of
      these

19. Joukowski transformation is given by
      a) $Z = \zeta + \frac{l^2}{\zeta}$        b) Z= $\zeta^2 + \frac{l}{\zeta^2}$       c) $Z = \frac{(\zeta-1)^{\wedge}2}{\zeta}$       d) none of these

20. Quantitative relation between circulation and lift is given by
      a) Kutta condition b) Kutta-Joukowski theorem  c) D' Alemberts' paradox
      d) Green's lemma

21. Centre of pressure of an aerofoil is a point on the aerofoil about which
      a) pitching moment is zero   b) pitching moment is positive  c) pitching
      moment doesn't vary d) none of these

22. Schlieren flow visualization technique is sensitive to
      a) Density gradient   b) second derivative of density   c) density
         contours      d)  none of these

23. Downwash for an infinite wing is
   a) zero  b) infinity  c) $\frac{r0}{2b}$ d) none of these.

24. Across a shock, static press, temp. and density increases; velocity and Mach number decreases. What will happen to the total pressure?
    a) increases  b) decreases  c) remains constant  d) none of these

25. Flow deflection angle at the contoured nozzle exit is
    a) zero  b) equal to the deflection angle corresponding to the nozzle Mach number c) model angle of attack     d) none of these

26. Normal component of the Mach number for a oblique shock is
    a) $M_1 \cos\beta$  b) $M_1 \sin\beta$  c) $M_1 \tan\beta$  d) $M_1 \sin\Theta$

27. Minimum value of Prandtl-Meyer function $v(M)$ corresponding to M=1 is

    a) п/2        b) zero      c) $\frac{\pi}{2}\left(\sqrt{\frac{\gamma+1}{\gamma-1}} - 1\right)$        d) none of these

28. Mach number of the flow normal to leading edge of a swept back wing is
    a) $M_\infty \sin\lambda$   b) $M_\infty \cos\lambda$    c) $\dfrac{\lambda}{\sqrt{M_\infty^2 - 1}}$      d)  none of these

29. The presence of tunnel walls confining the flow around a model in the test section …….. the velocity of the air in the vicinity of the model
    a) decreases        b) increases  c) doesn't affect  d) none of these

30. Partial differential equations governing inviscid supersonic flow region is
    a) hyperbolic        b) elliptic     c) parabola  d) mixed-type

31. Finite volume calculation can be made directly in the physical plane on a non-uniform mesh while the finite difference calculations on a non-uniform mesh requires
a) transformation  b) pressure correction c) artificial viscosity
d) none of these

32. For an inviscid flow, flow velocity at the wall is finite and the velocity vector immediately adjacent to the wall must be ……… to the wall
   a) normal b) tangential c) normal to the coordinate axis    d) none of these

33. Sweep back angle is the angle between the line of ……… and a perpendicular to the root chord
    a) 25% of chord b) Leading edge c) Trailing edge d) None of these

34. For incompressible flow, speed of sound is
    a) Zero  b)Infinite   c) 330 m/s  d) None of these

35. $C_p T_o = C_p T + \frac{u^2}{2}$   is
a)  Adiabatic energy equation b) isentropic energy equation c) perfect gas energy equation   d) none of these

36. In a given process of an ideal gas, dW=0 and dQ<0 ,then for the gas
a. dT <0
b. dV>0
c. dP=0
d. dT>0

37. What all is true for an adiabatic process
a) dQ=0
b) dW=-nC$_v$dT
c) TV$^{\gamma-1}$=constant
d) all the above three.

38. A sample of gas expands from volume V$_1$ to V$_2$.The amount of work done by the gas is greatest when the expansion is
a. Isothermal
b. Adiabatic
c. Isobaric
d. Equal in all the cases

39. ."Heat cannot by itself flow from a body at lower temperature to a body at higher temperature" is a statement of consequence of

(A) second law of thermodynamics
(B) conservation of momentum
(C) conservation of mass
(D) first law of thermodynamics.

40. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio C$_p$/C$_V$ for the gas is
(A) 4/3
(B) 2
(C) 5/3
(D) 3/2
41. Which of the following parameters does not characterize the thermodynamic state of matter?
(A) temperature
(B) pressure
(C) work
(D) volume

42 If the temperature of the sun were to increase from T to 2T and its radius from R to 2R, then the ratio of the radiant energy received on earth to what it was previously will be
(A) 4
(B) 16
(C) 32
(D) 64

43. Which of the following statements is correct for any thermodynamic system?
(A) The internal energy changes in all processes.
(B) Internal energy and entropy are state functions.
(C) The change in entropy can never be zero.
(D) The work done in an adiabatic process is always zero.

44. What is true for a free expansion process
a. dW=0
b. dQ=0
c. dU=0
d. all the above

45. What is true of Isothermal process
a. dT>0
b. dT=0
c. dQ=dW
d. none of the above

46. If dU=-dW for a process, the process is
a. Adiabatic
b. Isothermal
c. Isobaric
d. None of the above
47. What is true of a cyclic process
a. $\Delta Q=\Delta W$
b  $\Delta U=0$
c. $\Delta U >0$
d None of the above

48. Which one is not the assumption in kinetic theory of gases
a. the molecules of the gas are in continual random motion
b. The molecules interact during the collision

c. The molecules are tiny hard sphere undergoing inelastic collision
d. The collisions are of short duration

49. The amount of energy radiated by a body depends on
a. Nature of the surface
b. Area of the surface
c. Temperature of the surface
d. all the above

50. Work required to drive a compressor is minimum when compression process is
 a. Adiabatic b. Polytropic c. Isothermal d. Constant pressure process

51. Rotary compressors are suitable for
   a. Large discharge at high pressure b. Low discharge at high pressure
   c. Large discharge at low pressure d. Low discharge at low pressure.

52. Efficiency of a gas turbine is increased by
   a. Reheating b. Intercooling c. Adding a regenerator d. All of the above

53. The pressure ratio of an open cycle gas turbine compared to a closed cycle gas turbine of same HP is
 a. Higher b. Lower c. Same d. Unpredictable.

54. Location of pre-cooler is
   a. Before compressor b. After turbine c. In-between compressors  d. Before turbine.

55. In an isentropic nozzle expansion in a rocket unit
a. Pressure drops b. Absolute temperature drops c. Specific volume increases d. All of the above.

56. At choked flow condition in a supersonic nozzle it is possible to
 a. Increase the flow rate b. lower the exit pressure c. Increase the throat velocity d. None of these

57. Thrust of a turbojet engine for a given pressure ratio increases with
a. Higher maximum temperature b. Fuel flow rate c. Higher bypass air
d. None of these

58. Performance of a supersonic inlet is assessed by
a. total pressure recovery b. mass flow ratio c. cowl drag d. none of these

59. The cycle pressure ratio of a ramjet engine depends on
a. Flight velocity b. discharge nozzle c. diffuser d. none of these

60. Combustion stability in aircraft gas turbine depends on
a. Chamber pressure b. Flight altitude c. Forward speed d. None of these

61. The rate of flame propagation in combustion chamber is due to
a. Range of inflammability b. Pressure and Temperature of mixture c. Shape of combustion chamber d. None of these

62. Degree of reaction in an axial compressor stage is based on
a. Flow turning b. Enthalpy change c. Pressure rise d. None of these

63. The separation point on the compressor blade suction surface is fixed based on
   a. Incidence angle b. Degree of Turbulence c. Reynolds number d. None of these

64. Reaction turbine consists of adjustable guide vanes called
a. Stay vanes b. Wicket gates c. Runner d. impeller

65. For a supersonic nozzle the ratio between the throat area and any downstream area can be expressed as a function of
a) Pressure ratio and ratio of specific heats   b) Velocity ratio and ratio of specific heats  c) Mass flow rate and velocity ratio   d) None of these

66. In a rocket nozzle there will be subsonic flow in the divergent portion during sea level operation if the absolute chamber pressure drops below
 a) 1.56atm  b) 1.78atm   c) 1.67atm d) None of these

67. Mach reflection takes place if $M_2$ after the incident shock is
a) Lower than the detachment Mach number for $\theta$   b) Higher than the detachment Mach number for $\theta$   c) Equal to the separation Mach number d) None of these

68. The limiting values of the Mach number downstream of a normal shock are
a) 1 & 0.378   b) 1 & $\infty$   c) 0 & $\infty$ d) 0 & 0.378

69. A structural member under tension is called
a) Strut   b) Tie   c) Strut-tie  d) column

70. A perfect frame should satisfy the relation
a) n=2j-3   b) n=2j-4   c) n=3j-2  d) n=3j-3

71. The forces in the members of a frame are determined by
a) Method of joints   b) Method of sections  c) both a) and b)   d) None of these

72. The unit of stress in SI unit is
a) $MN/m^2$  b) $kN/m^2$   c) $N/mm^2$  d) All of these

73. The ratio between change in volume to original volume of the body is called
a) Tensile strain  b) compressive strain  c) shear strain  d) volumetric strain

74. Which of the following statements is incorrect
a) Stress directly proportional to strain with in elastic limit
b) The stress is force per unit area
c) Hooke's law holds good up to the breaking point
d) The ratio of linear stress to strain is called Young's modulus

75. Shear force at any point on the beam is the algebraic sum of
a) all vertical forces  b) all horizontal forces  c) vertical forces on either side of
the point   d) moment of forces on either side of the point

76. Bending moment at any point on the beam is equal to the algebraic sum of
a) all vertical forces   b) all horizontal forces  c) forces on either side of the
point   d) moments of forces on either side of the point

77. A beam of uniform strength is one with
a) same bending stress at all sections   b) same bending moment at all sections
c) same shearing stress at all sections   d) no shearing stress at all sections

78. The energy stored in a material during its deformation is known as
a) Elastic energy  b)  Plastic energy   c)  Strain energy   d) Potential energy

79. Principle planes are planes of
a) Maximum shear stress    b)  Minimum shear stress  c) Maximum normal
stress  d) Zero shear stress

80. Mohr circle is a graphical method to find out
a) Bending movement    b)  Shear force   c) Principal stresses  d) None of these

81. The Euler's formula is valid for
a) short column    b)  long column   c) Medium column    d) None of these

82. State of the stress at a point is specified enables one to determine
 1) Principal stress at the point  2)  Maximum shearing strain  3) Stress
component of any arbitrary plane containing that point
a) 1 and 2     b) 2 and 3     c) 3 and 1     d)  1,2 and 3

83. The bending stress is zero at
a) Neutral axis  b) Top layer of the beam   c)  bottom layer of the beam  d) None of these

84. A free bar of length L is uniformly heated from $0°c$ to $t°c$. $\alpha$ is the coefficient of linear expansion and E the modulus of elasticity. Then the stress in the bar is
a) $\alpha tE$   b) $\alpha tE/2$  c) Zero  d) None of the above

85. The lowest critical load of a column with both ends hinged is
a) $\pi^2EI/L^2$  b)  $2\pi^2EI/L^2$  c) $4\pi^2EI/L^2$  d) $\pi^2EI/4L^2$

86. An isotropic material has _____ numbers of independent elastic constants.
a) Nine   b) Three  c) Five  d) Two

87. The relation between major and minor Poisson's ratio ($\mu_{12}$ and $\mu_{21}$) and longitudinal and transverse modulus($E_1$ and $E_2$) for a composite material  is given by
a)$E_1\mu_{12} = E_2\mu_{21}$  b)$\mu_{12}/E_1=\mu_{21}E_2$   c) $E_1/\mu_{12}=E_2/\mu_{21}$  d) None of these

88. Rule of mixture for a composite material is
a) $E_1=E_{1f}v_f+E_mv_m$    b) $E_1/E_{1f}=v_f/v_m$    c) $E_1= E_{1f}v_fv_m$  d) None of these

89. Sandwich construction is widely used due to its
a) High stiffness to weight ratio  b) High strength to weight ratio  c) both a) and b)    d) None  of these

90. Filament winding process is used to manufacture composite structures like
a) Pressure vessels b) Flat plates c) complex shapes   d) None of these

91. Failure modes of sandwich construction is/are
a) General buckling  b) Face wrinkling  c) Inter cell buckling (Dimpling)   d) All the above

92. Experimental stress analysis by Photo elasticity method gives
a) local stress   b) whole field stress  c) both a) and b)    d) None of these

93. The principles of electrical strain gauge is
a) change in voltage of the wire due to load  b) Change in resistance of the wire due to load   c) change in insulation due to load   d) None of these

94. The natural frequency of a spring-mass system with a single degree of
   freedom is
   a)  $\sqrt{k/m}$  b) $k/m$   c) $\sqrt{m/k}$   d) None of these

95. If the damping ratio $\xi>1$, then the system is called
a) under damped   b) over damped  c) critically damped   d) None of these

96. The natural frequency of a simple pendulum  $\omega_n$ is
a) $\sqrt{g/L}$   b) $\sqrt{gL}$   c) $\sqrt{L/g}$  d) $g/L$

97. The force in the spring is directly proportional to
a) Displacement  b) velocity  c) acceleration  d) None of these

98. The force in the dash pot (damper) is directly proportional to
a) displacement   b) velocity   c) acceleration  d) None of these

99. The point of contra flexure is the point where
a) Bending moment changes sign b) Bending is minimum c) Bending moment is maximum d) Shear force is zero

100. Pick up the correct statement from the following:
a) The point of intersection of the bending axis with the cross section of the beam, is called shear centre
b) For I section, the shear centre coincides with the centroid of the section of the beam  c) For channels, the shear centre does not coincide its centroid
d) All the above