GATE-2011 Aerospace Engineering (AE)

Aerospace Engineering (AE)

Q. 1 – Q. 25 carry one mark each.

1. Consider x, y, z to be right-handed Cartesian coordinates. A vector function is defined in this coordinate system as $V = 3x\,\boldsymbol{i} + 3x\,\boldsymbol{j} + 3x\,\boldsymbol{k}$ where $\boldsymbol{i}, \boldsymbol{j}$ and $\boldsymbol{k}$ are the unit vectors along x, y and z axes, respectively. The curl of V is given by
   a) $z^2\,\boldsymbol{i} - 3y\,\boldsymbol{k}$
   b) $z^2\,\boldsymbol{j} + 3y\,\boldsymbol{k}$
   c) $z^2\,\boldsymbol{i} + 3y\,\boldsymbol{k}$
   d) $-z^2\,\boldsymbol{i} + 3y\,\boldsymbol{k}$

2. Which of the following functions is periodic?
   a) $f(x) = x^2$
   b) $f(x) = \log x$
   c) $f(x) = e^x$
   d) $f(x) = constant$

3. The function $f(x_1, x_2, x_3) = x_1{}^2 + x_2{}^2 + x_3{}^2 - 2x_1 - 4x_2 - 6x_3 + 14$ has its minimum value at
   a) (1,2,3)
   b) (0,0,0)
   c) (3,2,1)
   d) (1,1,3)

4. Consider the function $f(x_1, x_2) = x_1{}^2 + 2x_2{}^2 + e^{-x_1 - x_2}$ .The vector pointing in the direction of maximum increase of the function at the point (1, -1) is
   a) $\begin{pmatrix} 2 \\ -5 \end{pmatrix}$
   b) $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$
   c) $\begin{pmatrix} -0.73 \\ -6.73 \end{pmatrix}$
   d) $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$

5. Two simultaneous equations given by $y = \pi + x \; and \; y = \pi - x$ have
   a) a unique solution
   b) infinitely many solutions
   c) no solution
   d) a finite number of multiple solutions

6. In three-dimensional linear elastic solids, the number of non-trivial stress-strain relations, strain-displacement equations and equations of equilibrium are, respectively.

a) 3, 3 and 3
b) 6, 3 and 3
c) 6, 6 and 3
d) 6, 3 and 6

7. An Euler-Bernoulli beam in bending is assumed to satisfy
   a) both plane stress as well as plane strain conditions
   b) plane strain condition but not plane stress condition
   c) plane stress condition but not plane strain condition
   d) neither plane strain condition nor plane stress condition

8. A statically indeterminate frame structure has
   a) same number of joint degrees of freedom as the number of equilibrium equations
   b) number of joint degrees of freedom greater than the number of equilibrium equations
   c) number of joint degrees of freedom less than the number of equilibrium equations
   d) unknown number of joint degrees of freedom, which cannot be solved using laws of mechanics

9. Consider a single degree of freedom spring-mass-damper system with mass, damping and stiffness of $m, c \ and \ k$, respectively. The logarithmic decrement of this system can be calculated using
   a) $\dfrac{2\pi c}{\sqrt{4mk-c^2}}$
   b) $\dfrac{\pi c}{\sqrt{4mk-c^2}}$
   c) $\dfrac{2\pi c}{\sqrt{mk-c^2}}$
   d) $\dfrac{2\pi c}{\sqrt{mk-4c^2}}$

   GATE Aerospace Academy

10. Consider a single degree of freedom spring-mass system of spring stiffness k_1 and mass m which has a natural frequency of 10 rad/s. Consider another single degree of freedom spring-mass system of spring stiffness k_2 and mass m which has a natural frequency of 20 rad/s. The spring stiffness is k_2 is equal to
    a) k_1
    b) $2k_1$
    c) $\dfrac{k_1}{4}$
    d) $4k_1$

11. Consider a simply supported two-dimensional beam

    If the beam is converted into a fixed-fixed beam as

Best GATE Aerospace classroom coaching, 230+ Test series, doubt support, application download
www.gateaerospaceacademy.com
Call: 9000373757,8368433511

then the degree of static indeterminacy will
   a) increase by 3
   b) increase by 2
   c) decrease by 1
   d) decrease by 3

12. An impulsive launch of a rocket minimizes the loss of burn-out velocity due to
   a) aerodynamic drag force only
   b) gravitational force only
   c) both aerodynamic drag and gravitational forces
   d) reaction jet control force

13. Multi-staging in rockets improves the burn-out performance by increasing mainly stage-wise
   a) payload mass ratios
   b) structural mass efficiencies
   c) propellant masses
   d) control system masses

14. In an un-powered glide of an aircraft having weight W, lift L and drag D, the equilibrium glide angle is defined as
   a) $tan^{-1}\left(\frac{L}{D}\right)$
   b) $tan^{-1}\left(\frac{D}{L}\right)$
   c) $tan^{-1}\left(\frac{L}{W}\right)$
   d) $tan^{-1}\left(\frac{W}{L}\right)$

15. Lift on an aircraft climbing vertically up is
   a) equal to its weight
   b) zero
   c) equal to the drag
   d) equal to the thrust

16. If an aircraft is performing a positive yawing maneuver, the side slip angle
   a) is always zero
   b) is never zero
   c) is always negative
   d) could be any value

17. For an airplane to be statically stable, its centre of gravity must always be
    a) ahead of wing aerodynamic centre
    b) aft of the wing aerodynamic centre
    c) ahead of neutral point
    d) aft of neutral point

18. It is seen that the drag polar of a certain aerofoil is symmetric about the C_d axis. This drag polar could refer to
    a) NACA 0012
    b) NACA 4415
    c) NACA 23012
    d) None of the above

19. The aerodynamic centre of a supersonic aerofoil, with chord c, is located at
    a) the leading edge
    b) 0.25c
    c) 0.5c
    d) 0.75c

20. Winglets are used on wings to minimize
    a) skin friction drag
    b) profile drag
    c) wave drag
    d) induced drag

21. Consider a potential flow with free stream velocity V_∞.over a spinning circular cylinder of radius R and circulation Γ. The stream function, ψ, where ψ = 0 on the cylinder surface, in cylindrical coordinates (r,θ) is given by
    a) $V_\infty \ r \cos \theta \ \left(1 - \frac{R^2}{r^2}\right) + \frac{\Gamma}{2\pi} ln \frac{r}{R}$
    b) $V_\infty \ r \cos \theta \ \left(1 + \frac{R^2}{r^2}\right) + \frac{\Gamma}{2\pi} ln \frac{r}{R}$
    c) $V_\infty \ r \sin \theta \ \left(1 - \frac{R^2}{r^2}\right) + \frac{\Gamma}{2\pi} ln \frac{r}{R}$
    d) $V_\infty \ r \sin \theta \ \left(1 + \frac{R^2}{r^2}\right) + \frac{\Gamma}{2\pi} ln \frac{r}{R}$

22. A main objective of by-pass in a turbo-fan engine is to increase
    a) mass flow rate through engine inlet
    b) turbine inlet temperature
    c) mass flow rate through exhaust nozzle
    d) compressor pressure ratio

23. The pressure ratio in any one stage of a jet engine compressor is limited by
    a) entry stagnation temperature in that stage
    b) entry Mach number in that stage
    c) pressure gradient induced separation in that stage
    d) mass flow rate in that stage

24. Thermodynamic cycle on which the jet engine operates can be
    a) open Rankine cycle only
    b) either open or closed Rankine cycle
    c) open Brayton cycle only
    d) either open or closed Brayton cycle

25. Propulsion efficiency of a jet engine is
    a) directly proportional to both the thrust power and the air mass flow rate
    b) inversely proportional to both the thrust power and the air mass flow rate
    c) directly proportional to the thrust power and inversely proportional to the air mass flow rate
    d) inversely proportional to the thrust power and directly proportional to the air mass flow rate

Q. 26 to Q. 55 carry two marks each.

Questions Q.26 to Q. 30 are numerical answer type. The answer to each of these questions is either a positive whole number, or a positive real number with maximum of 2 decimal places.

26. Consider a cantilever beam having length $L = 1\ m$, square cross-section (width = depth = 0.01 m) and young's modulus $50\ GPa$. The beam is subjected to a transverse load $P = 1\ N$ at the mid-span $(L/2)$ at the center of the cross-section. Under the small deformation theory, the transverse deflection of the beam (in mm) at its free-end is _____.
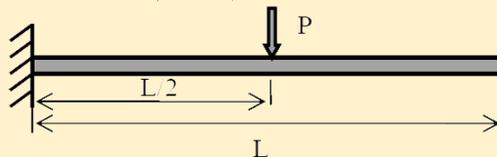
27. Consider a beam in bending with a solid circular cross-section of 1 mm², which is subjected to a transverse Shear force of 1 N. The shear stress at the center of the cross-section (in N/mm²) is_____.

28. A simply supported slender column of square cross section (width=depth=d) has to be designed such that it buckles at the same instant as it yields. Length of the column is given to be 1.57 m and it is made of a material whose young's modulus is 200 GPa and yield stress is 240 MPa. The width, d, of the column (in cm) should be _____.

29. A turbojet powered aircraft is flying at Mach number 0.8 at an altitude of 10 km. The inlet and exit areas of the engine are $0.7\ m^2\ and\ 0.4\ m^2$ respectively. The exhaust gases have velocity of $500\ m/s$ and pressure of $60\ kPa$. The free stream pressure, density and speed of sound are $26.5\ kPa, 0.413\ kg/m^3\ and\ 299.5\ m/s$ respectively. The thrust of the engine (in kN) is_____.

30. A low-speed wind tunnel has a contraction ratio of 14:1 and the cross-sectional area of the test section is 1 m². The static pressure difference between the settling chamber and the test section is 40 cm of water column. Assume $g = 9.81\ m/s^2, \rho_{air} = 1.2\ kg/m^3$ and $\rho_{water} = 1000\ kg/m^3$, The speed of air in the test section (in m/s) is _____.

Questions Q.31 to Q.55 are multiple choice type

31. Consider the function $f(x) = x - \sin x$ The Newton-Raphson iteration formula to find the root of the function starting from an initial guess $x^{(0)}$ at iteration k is

    a) $x^{(k+1)} = \dfrac{\sin x^{(k)} - x^{(k)} \cos x^k}{1 - \cos x^k}$

    b) $x^{(k+1)} = \dfrac{\sin x^{(k)} - x^{(k)} \cos x^k}{1 + \cos x^k}$

    c) $x^{(k+1)} = \dfrac{\sin x^{(k)} + x^{(k)} \cos x^k}{1 - \cos x^k}$

    d) $x^{(k+1)} = \dfrac{\sin x^{(k)} + x^{(k)} \cos x^k}{1 + \cos x^k}$

32. Consider the matrix $\begin{bmatrix} 2 & a \\ b & 2 \end{bmatrix}$ where a and b are real numbers. The two eigenvalues of this matrix $\lambda_1\ and\ \lambda_2$ are real and distinct $(\lambda_1 \neq \lambda_2)$ when

    a) $a < 0\ and\ b > 0$

    b) $a > 0\ and\ b < 0$

    c) $a < 0\ and\ b < 0$

    d) $a = 0\ and\ b = 0$

33. The solution of $\dfrac{dy}{dt} = y^3 e^t t^2$ with initial condition $y(0) = 1$ is given by

    a) $\dfrac{1}{9} e^t (t+3)^2$

    b) $\sqrt{\dfrac{9}{5 + 2e^t(t^2 - 2t + 2)}}$

    c) $\dfrac{4e^t}{(t+2)^2}$ **GATE Aerospace Academy**

    d) $\sqrt{\dfrac{1}{5 - 2e^t(t^2 - 2t + 2)}}$

34. A jet engine is operating at a Mach number of 0.8 at an altitude of 10 km. The efficiency of the air intake is 0.8 and that of the compressor is 0.87. The total temperatures (in K) at the exits of the air intake and the compressor respectively are

    (Ambient pressure = 26.5kPa; Ambient temperature = 223.3 K; Gas constant, $\gamma = 1.4, P_{rc} = 8.$

a) 251.9 and 458.2
b) 234.9 and 486.8
c) 251.9 and 486.8
d) 234.9 and 458.2

35. A rocket engine is tested on a test bed under the ideal condition of fully expanded jet. The exhaust velocity is 2 km/s through a nozzle of area 2.5 m². The mass flow rate is 200 kg/s. The specific impulse of the propellant and the thrust developed respectively are (assume g = 9.81 m/s²)
    a) 175.87 s and 200 kN
    b) 203.87 s and 400 kN
    c) 231.87 s and 200 kN
    d) 280.87 s and 400 kN

36. A body undergoes deformation under plane strain conditions when subjected to the following stresses (in MPa): $\sigma_{xx} = 450, \sigma_{yy} = 450, \tau_{xy} = 75, \tau_{xz} = 0, \tau_{yz} = 0$ What are the remaining components of stresses (in MPa) and strains? Assume the material to be isotropic and linear-elastic with Young's modulus $E = 200\ GPa$ and Poisson's ratio $v = 1/3$.
    a) $\sigma_{zz} = 0, \varepsilon_{xx} = 0.00225, \varepsilon_{yy} = 0.00225, \gamma_{xy} = 0.002, \gamma_{xz} = 0, \gamma_{yz} = 0,$
    b) $\sigma_{zz} = 300, \varepsilon_{xx} = 0.001, \varepsilon_{yy} = 0.001, \gamma_{xy} = 0.001, \gamma_{xz} = 0, \gamma_{yz} = 0,$
    c) $\sigma_{zz} = 300, \varepsilon_{xx} = 0.00225, \varepsilon_{yy} = 0.00225, , \gamma_{xy} = 0.001, \gamma_{xz} = 0, \gamma_{yz} = 0,$
    d) $\sigma_{zz} = 0, \varepsilon_{xx} = 0.001, \varepsilon_{yy} = 0.001, \gamma_{xy} = 0.002, \gamma_{xz} = 0, \gamma_{yz} = 0,$

37. Which of the following Airy's stress functions could satisfy the given boundary conditions, assuming constant values of $\sigma_{xx} = P, \sigma_{yy} = Q, , \tau_{xy} = R$, along the boundary?
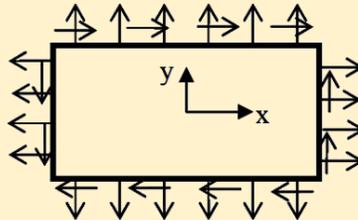
a) $\phi = P\frac{x^2}{2} + Q\frac{y^2}{2} - Rxy$
b) $\phi = P\frac{y^2}{2} + Q\frac{x^2}{2} + Rxy$
c) $\phi = P\frac{y^2}{2} + Q\frac{x^2}{2} - Rxy$
d) $\phi = P\frac{x^2}{2} + Q\frac{y^2}{2} + Rxy$

38. An aircraft is performing a coordinated turn manoeuvre at a bank angle of 30° and forward speed of 100 m/s. Assume $g = 9.81\ m/s^2$. The load factor and turn radius respectively are
   a) $\left(\frac{2}{\sqrt{3}}\right)$ and 1.76 km

b) $\sqrt{3}$ and 17.6 km

c) 2 and 0.18 km

d) $\left(\frac{2}{\sqrt{3}}\right)$ and 17.6 km

39. An aircraft in a steady level flight at forward speed of 50 m/s suddenly rolls by 180° and becomes inverted. If no other changes are made to the configuration or controls of the aircraft, the nature of the subsequent flight path taken by the aircraft and its characteristic parameter(s) (assume $g = 9.81 \ m/s^2$.) are
    a) straight line path with a speed of 50 m/s
    b) upward circular path with a speed of 50 m/s and radius of 127.4 m
    c) downward circular path with a speed of 50 m/s and radius of 127.4 m/s
    d) downward circular path with a speed of 25 m/s and radius of 254.8 m/s

40. An aircraft with a mass of 5000 kg takes off from sea level with a forward speed of 50 m/s and starts to climb with a climb angle of 15°. The rate of climb and excess thrust available at the start of the climb respectively (assume $g = 9.81 \ m/s^2$.) are
    a) 13.40 m/s and 13146.0 N
    b) 12.94 m/s and 12694.1 N
    c) 13.40 m/s and 12694.1 N
    d) 12.94 m/s and 13146.0 N

41. A glider having a mass of 500 kg is taken to an altitude of 1000 m with a jeep moving on ground at 54 kmph. Upon reaching the required altitude in 50 s, the glider is released and starts its descent. Under the assumption of equilibrium glide, the range and endurance of the glider for a constant lift-to-drag ratio of 15 are
    a) 15.0 km and 1002.2 s respectively
    b) 15.0 km and 601.3 s respectively
    c) 1.0 km and 601.3 s respectively
    d) 1.0 km and 50 s respectively

42. An elliptic orbit has its perigee at 400 km above the Earth's surface and apogee at 3400 km above the Earth's surface. For this orbit, the eccentricity and semi-major axis respectively are (assume radius of Earth = 6400 km)
    a) 0.18 and 8300 km
    b) 0.18 and 1900 km
    c) 0.22 and 8300 km
    d) 0.22 and 1900 km

43. An aircraft in level flight encounters a vertical gust, which excites the phugoid mode. The phugoid motion completes 10 cycles in 50 s and its amplitude reduces to half of its maximum value in 25s. The eigenvalues of the phugoid mode are
    a) $-0.05 \pm 0.02i$
    b) $-0.5 \pm 0.2i$
    c) $-0.028 \pm 1.26i$
    d) $0.028 \pm 1.26i$

44. Consider the inviscid, adiabatic flow of air at free stream conditions, M_1 = 2, p_1 = 1 atm and T_1 = 288 K around a sharp expansion corner (θ = 20°) as shown below. The Prandtl-Meyer function, v, is given as a function of Mach number, M, as $v(M) = \sqrt{\frac{\gamma+1}{\gamma-1}} \tan^{-1} \sqrt{\frac{\gamma-1}{\gamma+1}(M^2 - 1)} - \tan^{-1}\sqrt{M^2 - 1}$

    Assume air to be calorically perfect with γ = 1.4. The Mach number, M_2, downstream of the expansion corner is approximately
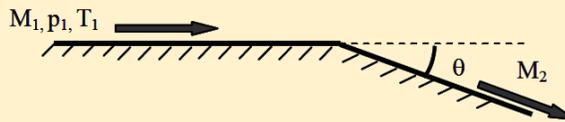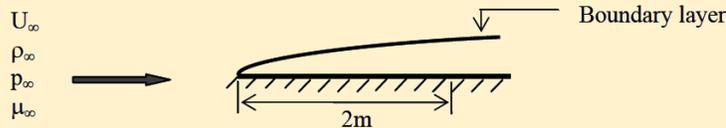

    a) 2.00
    b) 1.76
    c) 2.83   **GATE Aerospace Academy**
    d) 3.14

45. Consider a steady two dimensional zero-pressure gradient laminar flow of air over a flat plate as shown below. The free stream conditions are $U_\infty = 100 \frac{m}{s}, \rho_\infty = 1.2 \, kg/m^3$, p_∞ = 1 atm and $\mu_\infty = 1.8 \times 10^{-5} \frac{kg}{m.s}$

    The ratio of displacement thickness to momentum thickness of the boundary layer at a distance of 2 m from the leading edge is

    a) 7.53
    b) 2.59
    c) 2.91
    d) 0.39

46. In the context of Prandtl's lifting line theory for a finite wing, which of the following combinations of statements is **TRUE**?
    P: The bound vortex is responsible for the lift force

Q: The trailing vortices are responsible for the induced drag

R: The bound vortex is responsible for the induced drag

S: The trailing vortices are responsible for the lift force

    a) P,Q

    b) Q,R

    c) R,S

    d) P,S

47. Consider flow over a thin aerofoil at Mach number, $M_\infty = 0.5$ at an angle of attack, α. Using the Prandtl-Glauert rule for compressibility correction, the formula for lift coefficient, c_l, can be written as

    a) 5.44 α

    b) 6.28 α

    c) 7.26 α

    d) 14.52 α

Common Data for Questions

Common Data for Questions 48 and 49:

The partial differential equation (PDE) governing free vibrations of a uniform Euler-Bernoulli beam $EI\frac{\partial^4 w}{\partial x^4} + m\frac{\partial^2 w}{\partial t^2} = 0$, is where EI is the flexural stiffness, m is the mass per unit length, $w(x,t)$ is the bending displacement, x is the coordinate along the beam length, t is time and L is the beam Length
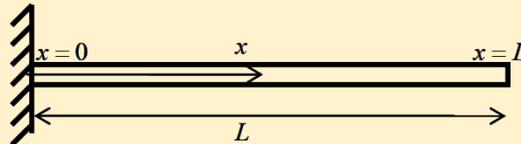
48. To solve the PDE, the number of boundary conditions (BC) and initial conditions (IC) needed are

    a) 4 BC, 3 IC

    b) 2 BC, 2 IC

    c) 2 BC, 4 IC

    d) 4 BC, 2 IC

49. For the cantilever beam shown in the figure, which of the following **CANNOT** be a possible boundary condition?

    a) $w(0,t) = 0$

    b) $\frac{\partial^2 w}{\partial x^2}(L,t) = 0$

    c) $\frac{\partial^2 w}{\partial x^2}(0,t) = 0$

d) $\frac{\partial^3 w}{\partial x^3}(L, t) = 0$

Common Data for Questions 50 and 51:

Consider an inviscid, adiabatic flow of air at free stream Mach Number, $M_\infty = 2$, across a compression corner ($\theta = 20°$) as shown. The free stream total enthalpy is $h_{0\infty} = 810 \, kJ \, kg^{-1}$. Assume that air is calorically perfect with $\gamma = 1.4, R = 287 \, J \, kg^{-1} \, K^{-1}$.
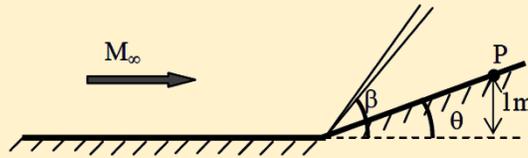
50. The shock angle β is
    a) $= 20°$
    b) $> 20°$ and $< 30°$
    c) $= 30°$
    d) $> 30°$

GATE Aerospace Academy

51. The total temperature at point P is
    a)   806.37 K
    b)   1128.92 K
    c)   1612.74 K
    d)   2257.84 K

Linked Answer Questions

Statement for Linked Answer Questions 52 and 53:

A thin-walled (thickness << radius), hollow shaft of length 1m and mean radius, $R = 5 \, cm$ has to be designed such that it can transmit a torque, $T = 7 \, kN - m$. A survey of different commercially available materials was made and following data was obtained from the suppliers (E: Young's modulus, τ_y yield stress in shear, ρ: density)

Material	E (Gpa)	τ_y (Mpa)	$\rho \, (kg/m^3)$
X	200	550	7700
Y	70	225	2700
Z	110	375	4875

52. Which of the above materials would you choose such that weight of the shaft is minimum?
    a)   X only
    b)   Y only
    c)   Z only

d) X OR Y

53. If you assume a factor of safety of 2, what should be the approximate thickness of such a shaft?
  a) 0.5 mm
  b) 1 mm
  c) 2 mm
  d) 4 mm

Statement for Linked Answer Questions 54 and 55:

Prandtl's lifting line equation for a general wing is given by

$$\alpha(y_0) = \frac{\Gamma(y_0)}{\pi U_\infty c(y_0)} + \alpha_{L=0}(y_0) + \frac{1}{4\pi U_\infty} \int_{-\frac{b}{2}}^{\frac{b}{2}} \frac{\left(\frac{\partial\Gamma}{\partial y}\right)}{y_0-y} dy,$$ where U_∞ is the free-stream velocity, α is the

angle of attack, y_0 is the spanwise location $\alpha_{L=0}(y_0)$, gives the spanwise variation of zero-lift angle, c is the chord, b is the span, and $\Gamma(y_0)$ gives the spanwise variation of circulation.

54. The rate of change of circulation with angle of attack $\Gamma_\alpha = \frac{\partial\Gamma}{\partial\alpha}$ is
  a) inversely proportional to α
  b) independent of α
  c) a linear function of α
  d) a quadratic function of α

55. Given that $C_L \propto \int_{-\frac{b}{2}}^{\frac{b}{2}} \Gamma(y)\, dy$, the corresponding lift curve-slope $\frac{\partial C_L}{\partial\alpha}$ is
  a) independent of α
  b) a linear function of α
  c) a quadratic function of α
  d) a cubic function of α

General Aptitude (GA) Questions

Q. 56 – Q. 60 carry one mark each.

56. Choose the word from the options given below that is most nearly opposite in meaning to the given word
Deference
  a) aversion
  b) resignation
  c) suspicion
  d) contempt

57. Choose the most appropriate word(s) from the options given below to complete the following

We lost confidence in him because he never _____ the grandiose promises he had made.

   a) delivered
   b) delivered on
   c) forgot
   d) reneged on

58. Choose the word or phrase that best completes the sentence below.

_____ in the frozen wastes of Arctic takes special equipment.

   a) To survive
   b) Surviving
   c) Survival
   d) That survival

59. In how many ways 3 scholarships can be awarded to 4 applicants, when each applicant can receive any number of scholarships?

   a) 4
   b) 12
   c) 64
   d) 81

60. Choose the most appropriate word from the options given below to complete the following sentence.

The _____ of evidence was on the side of the plaintiff since all but one witness testified that his story was correct.

   a) paucity
   b) propensity
   c) preponderance
   d) accuracy

Q. 61 to Q. 65 carry two marks each.

61. If $(2y + 1)/(y + 2) < 1$, then which of the following alternatives gives the CORRECT range of y ?

   a) $-2 < y < 2$
   b) $-2 < y < 1$
   c) $-3 < y < 1$
   d) $-4 < y < 1$

62. A student attempted to solve a quadratic equation in x twice. However, in the first attempt, he incorrectly wrote the constant term and ended up with the roots as (4, 3). In the second attempt, he incorrectly wrote down the coefficient of x and got the roots as (3, 2). Based on the above information, the roots of the correct quadratic equation are

   a) (-3, 4)

b) (3, -4)

c) (6, 1)

d) (4, 2)

63. L, M and N are waiting in a queue meant for children to enter the zoo. There are 5 children between L and M, and 8 children between M and N. If there are 3 children ahead of N and 21 children behind L, then what is the minimum number of children in the queue?

    a) 28

    b) 37

    c) 41

    d) 40

64. Four archers P, Q, R and S try to hit a bull's eye during a tournament consisting of seven rounds. As illustrated in the figure below, a player receives 10 points for hitting the bulls' eye, 5 points for hitting within the inner circle and 1 point for hitting within the outer circle.
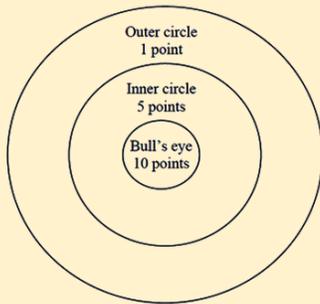
The final scores received by the players during the tournament are listed in the table below. the most accurate and the most consistent players during the tournament are respectively

Round	P	Q	R	S
1	1	5	1	10
2	5	10	10	1
3	1	1	1	5
4	10	10	1	1
5	1	5	5	10
6	10	5	1	1
7	5	10	1	1

    a) P and S

    b) Q and R

    c) Q and S

    d) R and Q

65. Nimbus clouds are dark and ragged, stratus clouds appear dull in color and cover the entire sky. Cirrus clouds are thin and delicate, whereas cumulus clouds look like cotton balls. It can be inferred from the passage that
    a) A cumulus cloud on the ground is called fog
    b) It is easy to predict the weather by studying clouds
    c) Clouds are generally of very different shapes, sizes and mass
    d) There are four basic cloud types: stratus, nimbus, cumulus and cirrus

Download our App

Download application for free Test, Assignments, enquiries and other benefits.
For Android, type **Gate Aerospace Academy** in google play store and get it.
https://play.google.com/store/apps/details?id=co.lynde.izlcw
For iOS contact personally
(9000373757,8368433511)

GATE AEROSPACE ACADEMY
Dedicated to Excellence

GATE AEROSPACE ACADEMY
Dedicated to Excellence

Gate Aerospace 2022 Toppers
★ ★ ★ ★ ★

Hritam Nath

Amit Vashistha

All India Rank ②

All India Rank ⑥

25 AIR Krishna	36 AIR Manasa	42 AIR David	62 AIR Vishal	66 AIR Sahil	81 AIR Prutvi Raj	98 AIR Akhilesh	98 AIR Avishi	98 AIR Ghouse	109 AIR Surya
118 AIR K somesh	134 AIR Sri Sai	140 AIR Spandan	148 AIR Bala V	162 AIR Bhagya Lakshmi	173 AIR Riya	189 AIR Ravi	226 AIR Megha	258 AIR Dhruv	328 AIR Dinesh

339 AIR Veeresh	390 AIR Ritu Raj	404 AIR Pradeep	486 AIR Girish	626 AIR Mandeep

HEARTY CONGRATULATIONS TO OUR STUDENTS FOR THEIR EXCEPTIONAL PERFORMNACE IN

— **GATE AEROSPACE 2021** —

05 AIR Raghunathan	10 AIR Vikrant	13 AIR Priywart	17 AIR Eshwar	23 AIR Sana	27 AIR Karthik	33 AIR Ratnashree	37 AIR Thositha
39 AIR Mukesh	39 AIR Riya	39 AIR Shiva	47 AIR Shashank	47 AIR Surya	53 AIR Nandini	59 AIR Mayank	64 AIR K.Madhulaasa
89 AIR Vishnu	89 AIR Samridh	98 AIR Anubhav	118 AIR Pratyush	129 AIR Ranjith	134 AIR Shivam	152 AIR Vineeth	173 AIR Satvika

GATE AEROSPACE ACADEMY
DEDICATED TO EXCELLENCE

HEARTY CONGRATULATIONS TO OUR STUDENTS FOR THEIR EXCEPTIONAL PERFORMANCE IN

GATE AEROSPACE 2020

03 AIR MAHENDRA GEHLOT Gate Aerospace Academy	04 AIR SHYAM KUMAR Gate Aerospace Academy	10 AIR HARSHIL GOHEL Gate Aerospace Academy	31 AIR AISHWARYA Gate Aerospace Academy

34 AIR VIKAS Gate Aerospace Academy	40 AIR AKSHAY Gate Aerospace Academy	49 AIR SREE LEKHMI Gate Aerospace Academy	51 AIR PANKAJ Gate Aerospace Academy	62 AIR RAGHVENDRA Gate Aerospace Academy	74 AIR KARTIK Gate Aerospace Academy	and many more...

Best GATE Aerospace classroom coaching, 230+ Test series, doubt support, application download

www.gateaerospaceacademy.com

Call: 9000373757,8368433511

GATE AEROSPACE ACADEMY
Dedicated to Excellence

Gate AeroSpace 2019 Results

02 AIR	31 AIR	36 AIR	51 AIR	75 AIR	81 AIR
95 AIR	100 AIR	128 AIR	138 AIR	151 AIR	155 AIR
168 AIR	175 AIR	198 AIR	230 AIR	242 AIR	
		245 AIR	247 AIR	260 AIR	

Hearty congratulations to our Classroom Program student from Karunya Institute of Technology and Sciences for his extraordinary performance in Gate Aerospace 2021

AIR-13
PRIYWART KHATRI
www.gateaerospaceacademy.com

Hearty congratulations to our Classroom Program students from Rajasthan Technical University Kota for their extraordinary performance in Gate Aerospace 2021

AIR-10 VIKRANT VASHISTHA
AIR-39 MUKESH GOKLANI
AIR-59 MAYANK AGARWAL
AIR-98 ANUBHAV JOSHI
www.gateaerospaceacademy.com

Hearty congratulations to our Classroom Program students for their extraordinary performance in Gate Aerospace 2021

AIR-47 M.SURYA REVA UNIVERSITY BANGALORE
AIR-39 RIYA PATEL APOLLO INSTITUTE OF ENGINEERING
AIR-47 SHASHANK KUMAR AMITY UNIVERSITY NOIDA
www.gateaerospaceacademy.com

Hearty congratulations to our Classroom Program students from Institute of Aeronautical Engineering college for their extraordinary performance in Gate Aerospace 2021

AIR-39 M.SHIVA TEJA REDDY
AIR-64 K.MADHULAALASA
AIR-152 P.VINEETH
www.gateaerospaceacademy.com

Hearty congratulations to our Classroom Program students for their extraordinary performance in Gate Aerospace 2021

AIR-53 NANDINI JAIN SRM INSTITUTE OF SCIENCE AND TECHNOLOGY, CHENNAI
AIR-89 M.VISHNU TEJA MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL
AIR-89 SAMRIDH PATIAL UNIVERSITY OF PETROLEUM AND ENERGY STUDIES, DEHRADUN
www.gateaerospaceacademy.com

HEARTY CONGRATULATIONS TO OUR STUDENT K SWARNASHEE FOR SELECTING AS A JUNIOR RESEARCH FELLOWSHIP AT DRDO
K.Swarnashree
www.gateaerospaceacademy.com

Best GATE Aerospace classroom coaching, 230+ Test series, doubt support, application download

www.gateaerospaceacademy.com

Call: 9000373757,8368433511

Our gallery

Best GATE Aerospace classroom coaching, 230+ Test series, doubt support, application download

GATE AEROSPACE ACADEMY
Dedicated to Excellence

Our Books

GATE 2023 AEROSPACE ENGINEERING
PREVIOUS YEAR'S SOLUTIONS BOOK
2007-2022

www.gateaerospaceacademy.com

AEROSPACE ENGINEERING
PROBLEM SHEETS VOLUME 1

www.gateaerospaceacademy.com

AEROSPACE ENGINEERING
PROBLEM SHEETS VOLUME 2

www.gateaerospaceacademy.com

AEROSPACE ENGINEERING
FORMULA BOOK

www.gateaerospaceacademy.com

GATE AEROSPACE STUDY MATERIAL
AIRCRAFT STRUCTURES

www.gateaerospaceacademy.com

GATE AEROSPACE STUDY MATERIAL
ENGINEERING MATHEMATICS

www.gateaerospaceacademy.com

GATE AEROSPACE STUDY MATERIAL
SPACE MECHANICS

www.gateaerospaceacademy.com

GATE AEROSPACE STUDY MATERIAL
AERO DYNAMICS

www.gateaerospaceacademy.com

GATE AEROSPACE STUDY MATERIAL
FLIGHT MECHANICS

www.gateaerospaceacademy.com

GATE AEROSPACE STUDY MATERIAL
JET PROPULSION

www.gateaerospaceacademy.com

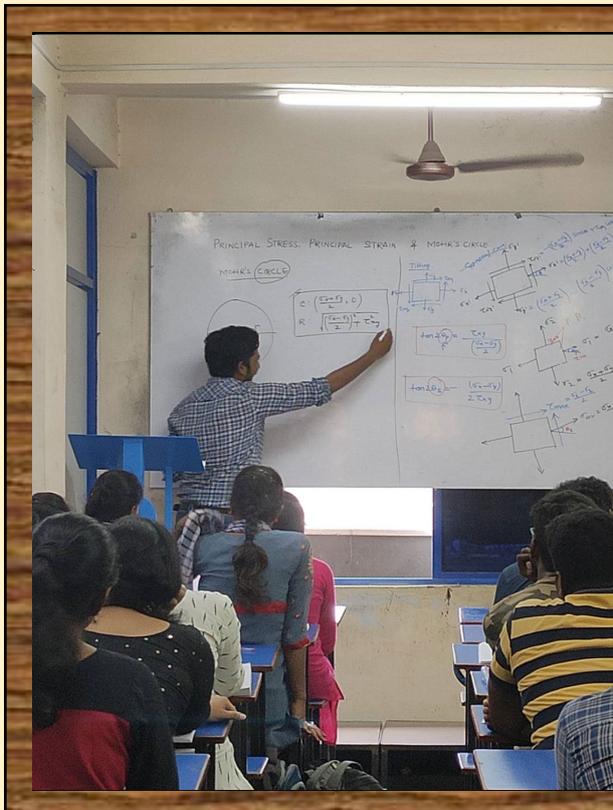**Best GATE Aerospace classroom coaching, 230+ Test series, doubt support, application download**

www.gateaerospaceacademy.com   **Call: 9000373757,8368433511**