GATE-2017 Aerospace Engineering (AE)

Aerospace Engineering (AE)

Q. 1 – Q. 25 carry ONE marks each.

1) Given the vectors $\overrightarrow{v_1} = \hat{\imath} + 3\hat{\jmath}$, $\vec{v}_2 = 2\hat{\imath} - 4\hat{\jmath} + 3\hat{k}$, the vector $\overrightarrow{v_3}$ perpendicular to both $\overrightarrow{v_1}$ and $\overrightarrow{v_2}$ is given by

(A) $\overrightarrow{v_3} = \overrightarrow{v_1} - (\overrightarrow{v_1}.\overrightarrow{v_2})\frac{\overrightarrow{v_2}}{|\overrightarrow{v_2}|}$ (B) $\overrightarrow{v_3} = \hat{k}$

(C) $\overrightarrow{v_3} = \overrightarrow{v_2} - (\overrightarrow{v_1}.\overrightarrow{v_2})\frac{\overrightarrow{v_1}}{|\overrightarrow{v_1}|}$ (D) $\overrightarrow{v_3} = \frac{\overrightarrow{v_1}\times\overrightarrow{v_2}}{|\overrightarrow{v_1}\times\overrightarrow{v_2}|}$

2) The value of integral $I = \int_C \big((x-y)dx + x^2dy\big)$ with C the boundary of the square $0 \le x \le 2$; $0 \le y \le 2$, is _____.

3) Let $\overrightarrow{v(t)}$ be a unit vector that is a function of the parameter *t*. Then $\vec{v}.\frac{d\vec{v}}{dt}$ =_____.

4) The eigenvalues λ_n and eigenfunctions $u_n(x)$ of the Sturm- Liouville problem $\frac{d^2y}{dx^2} + k^2\lambda y = 0$, $0 < x < 1$; $y(0) = 0$; $y(1) = 0$ are given by

(A) $\lambda_n = n^2\pi^2$; $u_n(x) = \sin\lambda_n x$, $n = 0, \pm1, \pm2, \dots, \infty$

(B) $\lambda_n = n^2\pi^2/k^2$; $u_n(x) = \sin kn\pi x$, $n = 0, \pm1, \pm2, \dots, \infty$

(C) $\lambda_n = n^2\pi^2/k^2$; $u_n(x) = \sin n\pi x$, $n = 0, \pm1, \pm2, \dots, \infty$

(D) $\lambda_n = n^2\pi^2$; $u_n(x) = \sin n\pi x$, $n = 0, \pm1, \pm2, \dots, \infty$

5) 3-point Gaussian integration formula is given by $\int_{-1}^{1} f(x)dx \approx \sum_{j=1}^{3} A_j f(x_j)$ with $x_1 = 0$, $x_2 = -x_3 = -\sqrt{\frac{3}{5}}$; $A_1 = \frac{8}{9}$, $A_2 = A_3 = \frac{5}{9}$. This formula exactly integrates

(A) $f(x) = 5 - x^7$ (B) $f(x) = 2 + 3x + 6x^4$

(C) $f(x) = 13 + 6x^3 + x^6$ (D) $f(x) = e^{-x^2}$

6) Which one of the following statements is NOT true

(A) The pitching moment of any airfoil at any angle of attack is always zero at the center of pressure

(B) The pitching moment of any airfoil at any angle of attack is always zero at the aerodynamic center

(C) The center of pressure and aerodynamic center coincide for a symmetric airfoil

(D) The pitching moment about the aerodynamic center, for any airfoil, does not vary with angle of attack

7) Which one of the following statements is NOT true

(A) Compared to a laminar boundary layer, a turbulent boundary layer is more desirable on a wing operating at large angle of attack

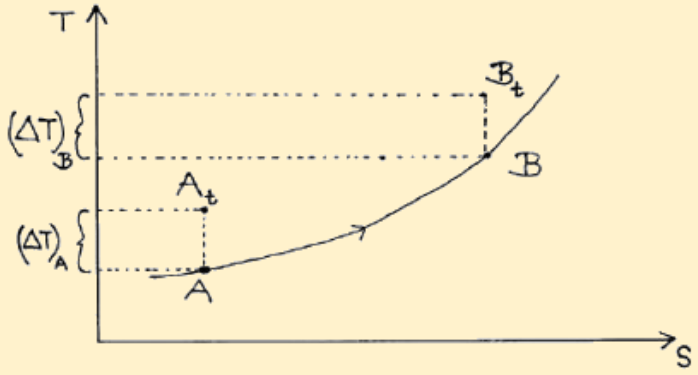
(B) The skin friction drag for a turbulent boundary layer is larger than that for a laminar boundary layer

(C) The location of transition from laminar to turbulent boundary layer depends only on the operating Reynolds Number

(D) A separated flow does not necessarily lead to a turbulent boundary layer

8) A De Laval nozzle is to be designed for an exit Mach number of 1.5. The reservoir conditions are given as $P_0 = 1$ atm (gauge). $T_0 = 20°C, \gamma = 1.4$. Assuming shock free flow in the nozzle, the exit absolute pressure (in atm) is _____ (in three decimal places).

9) Consider a steady one dimensional flow of a perfect gas with heat transfer in a duct. The T-s diagram (shown below) shows both the static and the stagnation conditions at two locations, A and B in the duct, A_t and B_t denote stagnation conditions for states A and B respectively. It is known that $(\Delta T)_A = (\Delta T)_B$. M_A and M_B are the Mach numbers of the flow at locations A and B.



Which of the following statements is true about the flow.

(A) Flow is subsonic and $M_A < M_B$

(B) Flow is supersonic and $M_A > M_B$

(C) Flow is subsonic and $M_A > M_B$

(D) Flow is supersonic and $M_A < M_B$

10) To ensure only the longitudinal static stability (and not the condition for equilibrium) of a low speed aircraft. The aircraft components must be designed to satisfy which one of the following conditions:

(A) $\frac{\partial C_m}{\partial \alpha} < 0$ and $C_{m0} > 0$

(B) $\frac{\partial C_m}{\partial \alpha} < 0$

(C) $\frac{\partial C_m}{\partial C_L} < 0$ and $C_{m0} < 0$

(D) $\frac{\partial C_m}{\partial C_L} = 0.0$

11) Which of the following statement(s) is/are true about the shear centre of a cross-section:

P: It is that point in the cross-section through which shear loads produce no twisting.

Q: This point is also the centre of twist of sections subjected to pure torsion.

R: The normal stress at this point is always zero.

(A) P, Q and R

(B) P only

(C) P and Q only

(D) P and R only

12) Let $\bar{N}_m$ and $\bar{N}_o$ be respectively the non-dimensional locations of the stick-fixed maneuver point and stick-fixed neutral point of a low speed conventional aircraft. These distances are measured with respect to the nose of the fuselage. The numerical value of $\bar{N}_m - \bar{N}_o$

(A) Will always be negative

(B) Will always be positive

(C) Will always be zero

(D) Can have any value depending on the location pf the centre of the gravity of the aircraft

13) The phenomenon of rudder lock in conventional low speed aircraft is primarily due to

(A) Large value of directional derivative, $C_{n\beta}$

(B) The sidewash due to fuselage on the vertical stabilizer
(C) The tendency of rudder to float rapidly at high angles of side-slip
(D) The sidewash due to wing on the vertical stabilizer

14) The period of revolution of earth about the sun is 365.256 days, approximately. The semi-major axis of the earth's orbit is close to 1.4953×10^{11}m. The semi major axis of the orbit of Mars is 2.2783×10^{11}m. The period of revolution of Mars, about the sun, is _____ Earth Days (in three decimal places)

15) Consider a system consisting of a certain amount of perfect gas enclosed in a cylinder filled with a frictionless piston. This system can undergo following processes
(i) Expansion with the finite pressure difference with the surrounding.
(ii) Compression with infinitesimal pressure difference with surrounding
(iii) Heat transfer with the finite temperature difference with the reservoir
(iv) Heat transfer with infinitesimal temperature difference with reservoir
Out of these which processes are reversible?
(A) (i) and (iii) (B) (i) and (iv)
(C) (ii) and (iii) (D) (ii) and (iv)

16) Among the following engines, which one is expected to have the maximum Specific Impulse?

(A) Cryogenic Rocket (B) Solid Propellant Rocket
(C) Liquid Propellant Rocket (D) SCRAM Jet

17) The maximum gas flow rate that can be handled by a multi-stage axial compressor at a given rotational speed is dictated by
(A) Compressor Surge (B) Rotating Stall
(C) Choking (D) Optimum Design Pressure Ratio

18) For a turbine stage, which one of the following losses occur due to the turning of the wall boundary layer through an angle due to curved surface?
(A) Profile Loss (B) Annulus Loss
(C) Tip Clearance Loss (D) Secondary Flow Loss

19) In the vane-less space between the impeller and the diffuser vanes in a Centrifugal Compressor, the angular momentum varies in the following manner in the radial direction
(A) Increases (B) Remains constant
(C) Decreases (D) First increases then decreases

20) Which of the following statements about the neutral axis of a beam with unsymmetrical cross section is true:
(A) The product of second moment of area about the neutral axis is always zero.
(B) The normal stress along the neutral axis is always zero
(C) The shear stress along the neutral axis is always zero.
(D) The product of second moment of area about the neutral axis and normal stress about the neutral axis are always zero.

21) Assuming that the aircraft is flying straight, the top spar cap/flange of a wing is most likely to fail in

(A) Yielding (B) Buckling
(C) Crushing (D) Creep

22) A 2-DOF undamped spring-mass system with two masses and two springs has natural frequencies ω_1 = 0.79 rad/s and ω_2 = 1.538 rad/s. The mode shapes for the system are given by $\emptyset_1 = [0.732\ 1]^T$ and $\emptyset_2 = [-2.73\ 1]^T$. If the first mass is displaced by 1 cm, the minimum displacement in cms to be given to the second mass to make the system vibrate in first mode alone is = _____.(in three decimal places)

23) An aircraft landing gear can be idealized as a single degree of freedom spring-mass-damper system. The desirable damping characteristics of such a system is:
(A) Under damped (B) Over damped
(C) Critically damped (D) Undamped

24) A single degree of freedom spring-mass system of natural frequency 5 Hz is modified in the following manners:
Case 1: Viscous damping with damping ratio ζ = 0.2 is introduced in parallel to the spring.
Case 2: The original undamped spring-mass system is moved to a surface with coefficient of friction, μ = 0.01
The ratio of the damped natural frequency for the case 1 and 2 is given by _____. (in three decimal places)

25) Which of the following statements about the compatibility equations are true:
P: Strain compatibility equations must be satisfied in the solution of three-dimensional problems in elasticity.
Q: Six strains are defined in terms of three displacement functions and can have arbitrary values.
R: Compatibility equations are an expression of the continuity of displacements.

(A) P and Q (B) Q and R (C) P and R (D) P, Q and R

Q. 26 – Q. 55 carry two marks each.

26) Matrix $[A] = \begin{bmatrix} 2 & 0 & 2 \\ 3 & 2 & 7 \\ 3 & 1 & 5 \end{bmatrix}$ and vector $\{b\} = \begin{Bmatrix} 4 \\ 4 \\ 5 \end{Bmatrix}$ are given. If vector $\{x\}$ is the solution to the system of equations $[A]\{x\} = \{b\}$ which of the following is true for $\{x\}$:

(A) Solution does not exist (B) Infinite solutions exist
(C) Unique solutions exist (D) Five possible solutions exist

27) Let Matrix $[A] = \begin{bmatrix} 2 & -6 \\ 0 & 2 \end{bmatrix}$. Then for any non-trivial vector $\{x\} = \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix}$, which of the following is true for the value of $K = \{x\}^T[A]\{x\}$:

(A) K is always less than zero (B) K is always greater than zero
(C) K is non-negative (D) K can be anything

28) Consider the initial value problem
$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 6y = f(t);\ y(0) = 2, \left(\frac{dy}{dt}\right)_{t=0} = 1.$
If $Y(s) = \int_0^\infty y(t)e^{-st}dt$ and $F(s) = \int_0^\infty f(t)e^{-st}dt$ are the Laplace Transforms of $y(t)$ and $f(t)$ respectively, then $Y(s)$ is given by:

(A) $\frac{F(s)}{(s^2+4s+6)}$ (B) $\frac{F(s)+2s+9}{(s^2+4s+6)}$

(C) $\frac{F(s)}{(-s^2+4s+6)}$ (D) $\frac{F(s)-2s+9}{(s^2+4s+6)}$

29) Let $u(x,t)$ denote the displacement of a point on a rod. The displacement satisfies the following equation of motion:

$\frac{\partial^2 u}{\partial t^2} - 25\,\frac{\partial^2 u}{\partial x^2} = 0,\ 0 < x < 1$

with $u(x,0) = 0.01\sin(10\pi x)$, $\frac{du}{dt}(x,0) = 0$; $u(0,t) = 0, u(1,t) = 0$. The value of $u(0.25,1)$ is _____ (in three decimal places).

30) The equation $x^2\frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + 4y = 0$ has a solution $y(x)$ that is:

(A) A polynomial in x
(B) Finite series in terms of non-integer fractional powers of x
(C) Consists of negative integer powers of x and logarithmic function of x
(D) Consists of exponential functions of x.

31) Consider a straight wing with rectangular planform of aspect ratio 10 and with a NACA 0012 airfoil. The span effectiveness factor for this wing is 0.95. Assume the flow to be incompressible and governed by thin airfoil theory. The lift coefficient of this wing at an angle of attack of 6 deg is _____ (in three decimal places).

32) Consider an incompressible flow over a flat plate with the following approximation to the velocity profile:

$$\frac{u(y)}{U} = \begin{cases} \frac{y}{\delta} & for\ \ y \le \delta \\ 1 & for\ \ y > \delta \end{cases}$$

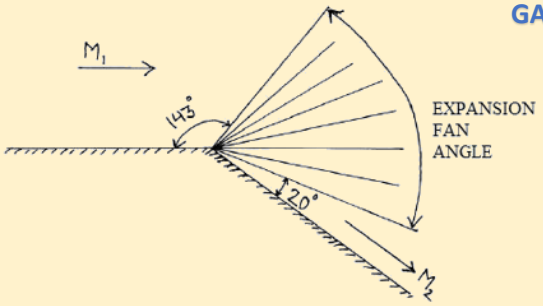
Where δ is the boundary layer thickness and U the freestream speed. The normalized momentum thickness (θ/δ) for this profile is _____ (in three decimal places).

33) An idealized velocity field is given by $\vec{V} = 4tx\hat{\imath} - 2t^2y\hat{\jmath} + 4xz\hat{k}$. At point (-1, 1, 0) and at t=1. The magnitude of the material acceleration vector of the fluid element is _____.

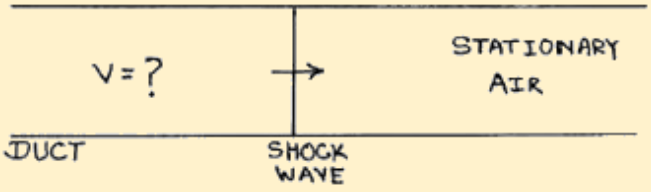
34) A trace from the schlieren photograph of the flow around a corner reveals the edges of an expansion fan as shown below. The leading and trailing edges of the expansion fan make the angles as shown below. Assuming $\gamma = 1.4$, the angle of the expansion fan (in degrees) is _____ (in two decimal places).

Prandtl-Meyer function is given by

$$v(M) = \sqrt{\frac{\gamma+1}{\gamma-1}}\tan^{-1}\sqrt{\frac{\gamma-1}{\gamma+1}(M^2-1)} - \tan^{-1}\sqrt{(M^2-1)}$$



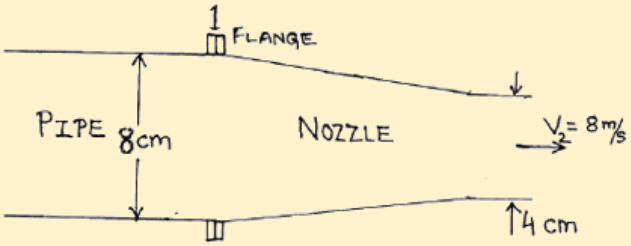
35) A strong normal shock wave, with a pressure ratio of 29 across it, is travelling into stationary air ($\gamma = 1.4$) at T = 280 K in a straight duct (see figure). The magnitude of the velocity of the air induced behind the shock wave is _____m/s (round to nearest integer).



Gas constant = 287 J/kg.K, Shock wave relations:

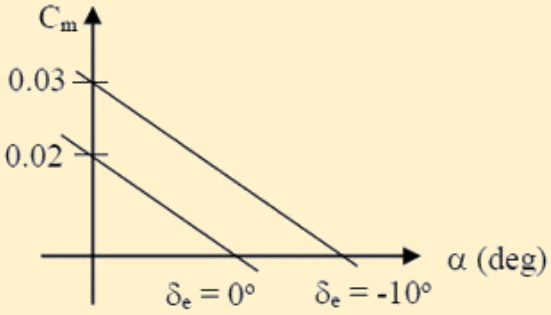
Pressure ratio: $\frac{p_2}{p_1} = 1 + \frac{2\gamma}{\gamma+1}(M^2 - 1)$; Density ratio: $\frac{\rho_2}{\rho_1} = \frac{(\gamma+1)M^2}{2+(\gamma-1)M^2}$

36) In the figure below, water exits from a nozzle into atmospheric pressure of 101 kPa. If the exit velocity is V_2 = 8m/s and friction is neglected. The magnitude of the axial force on the flange at location 1 required to keep the nozzle attached to the pipe is _____ N (round to nearest integer).



37) A football, meant to be thrown at 100 km/hr in sea level air (ρ = 1.22 kg/m^3, $\mu = 1.78\times10^{-5}$ Ns/m^2), is to be tested using a one-quarter scale model in a water tunnel (ρ = 1000 kg/m^3, $\mu = 10^{-3}$ Ns/m^2). For dynamic similarity, the ratio of the model force to the prototype force is _____ (nearest integer).

38) An aircraft model was tested in a low speed wind tunnel (Reynolds number = 2x10^6 based on wing mean chord). The variation of pitching moment coefficient (C_m) with angle of attack (α) for two elevator deflections (δ_e) as recorded during this test is presented below.



Based on the result present in the figure above, the value of elevator control power ($C_{m\delta e}$) in per radian will be _____ (in three decimal places).

39) A pilot was flying a single engine propeller aircraft and maintaining a steady level flight at a lift coefficient, $C_L = 0.5$ at an altitude of 500 m. Due to some emergency, at the same altitude (500 m), the pilot had to fully deploy the landing gear. If the pilot wants to maintain steady level flight at the same $C_L = 0.5$ and at the same altitude, which of the following control actions should the pilot undertake:

(A) move the elevator up, and decrease the throttle
(B) move the elevator up, and increase the throttle

(C) move the elevator down, and decrease the throttle
(D) move the elevator down, and decrease the throttle

40) A conventional low speed aircraft had the following aerodynamic characteristics:
C_{D0} = 0.020, e = 1.0 (Oswald efficiency).
The aircraft was flown to maintain a steady level flight and for minimum thrust required, at a lift coefficient of $C_L = 0.8$. The numerical value of the aspect ratio of the wing is _____ (in three decimal places).

41) A batch of aluminium alloy yields in uniaxial tension at the stress of 330 MN/m^2. If this material is subjected to the following state of stress:
σ_x = 140MN/m^2 , σ_y = -70 MN/m^2 , σ_z = 0, τ_{xy} = x MN/m^2 , τ_{yz} = 0, τ_{zx} = 0. The value of x that would result in yielding according to the Von Mises failure criterion is _____. (in three decimal places)

42) The roots obtained by solving longitudinal characteristics equations of motion for a statically stable aircraft are given below:
$\lambda_{1,2} = -0.02 \pm 0.30i$, $\lambda_{3,4} = -2.00 \pm 2.50i$, where $i = \sqrt{-1}$
The undamped short-period longitudinal natural frequency (radians/sec) and damping ratio, in that order, are close to

(A) 3.40, 0.73 (B)3.36, 0.65
(C) 3.83, 0.56 (D)3.20, 0.63

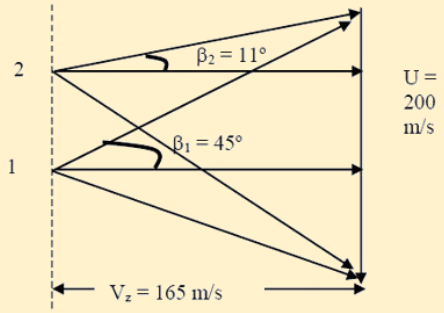
43) An aircraft is to be designed to ensure that it has enough excess power to achieve steady climb at flight path angle, $\gamma = 10$ degrees, maintaining $\frac{C_L}{C_D} = 10.0$. The numerical value of the thrust to weight ratio of the complete aircraft to meet the above requirement under standard atmospheric condition will be _____ (in three decimal places).

44) A conventional aircraft was analysed to estimate the contribution of wing towards C_{m0} (C_m at α=0) of the whole aircraft. The wing was installed with zero setting angle along the fuselage reference line. Further, the wing was laid such that $\bar{X}_{ac,w} = 0.3$ and $\bar{X}_{cg,aircraft} = 0.4$. $\bar{X}_{ac,w}$ and $\bar{X}_{cg,aircraft}$ are the non-dimensionless distances from the leading edge of the wing to the aerodynamic centre of the wing and centre of gravity of the aircraft respectively. The wing had following aerodynamic characteristics:
C_{L0} = 0.20, $C_{mac,wing}$ = -0.02.
The numerical value of $C_{m0,w}$ (contribution of wing to C_{m0}) about the C.G of the aircraft is _____ (in two decimal places).

45) In a combustor, gaseous Octane (C_8H_{18}) and air are to be burned in stoichiometric proportions. If the required flow rate of air is 1kg/s, what should be the corresponding flow rate of Octane?

(A) 0.066 kg/s (B)15.15 kg/s (C) 0.16 kg/s (D) 6.25 kg/s

46) The given diagram represents the velocity triangles at the leading edge (1) and the trailing edge (2) at the mean radius of a single stage axial compressor rotor. The stage efficiency of the compressor is 0.8. The stagnation temperature of air entering the stage is 298 K and the specific heat at constant pressure for air is 1.005 kJ/kg.K. The ratio of specific heat for air is 1.4. Considering actual work in the rotor is equal to the ideal work, the pressure ratio for the stage is equal to_____ (in two decimal points).



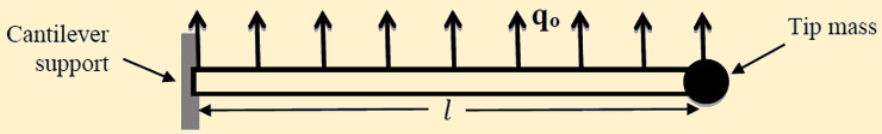
47) An aircraft with a turbojet engine, having an inlet area of 1 m^2, is flying at 270 m/s at an altitude where the atmospheric pressure is equal to 0.9 bar and the ambient temperature is equal to 290 K. The stagnation pressure and temperature at the exit of the turbine are equal to 1.6 bar and 774 K respectively. The specific heat at constant pressure of the burned gases is equal to 1.147 kJ/kg.K and the ratio of specific heats is equal to 1.33. Considering the ideal expansion in the nozzle with no losses, the specific thrust produced by the engine is _____ Ns/kg. (in one decimal place)

48) Air, at 450 K stagnation temperature and at a rate of 50 kg/s, enters the combustor of a turbofan engine and is burned with 1 kg/s of Aviation Kerosene (Heating value 44 MJ/kg). The specific heat at constant pressure for the incoming air and the burned products are 1.005 kJ/kgK and 1.147 kJ/kgK respectively. Considering 100% burner efficiency, the stagnation temperature at the exit of the combustor is equal to _____K.

49) A single stage chemical rocket having an initial mass of 10,000 kg and specific impulse of 450 s, is launched from the surface of the earth and has to reach the escape velocity (11 km/s) at burn out. Consider g_e = 9.8 m/s^2. If the atmospheric drag and the effect of gravity are to be neglected, the mass of propellant to be carried by the rocket is equal to _____ kg (in one decimal place).

50) A centrifugal compressor requires 1800 kW of power to compress 10 kg/s of air. Consider the whirl velocity component is equal to the impeller speed (i.e. no slip) and no losses in the impeller. If the impeller has to rotate at 1900 rad/s, the diameter of the impeller is to be _____m (in two decimal place).

51) An aircraft wing is idealized as a cantilever beam of constant width and length l with a tip mass of weight **W** (Newtons) and has a uniformly distributed loading of q_o (Newtons/m) as shown in the figure. Flexural rigidity = ***EI*** and $q_o l = 10\,W$.

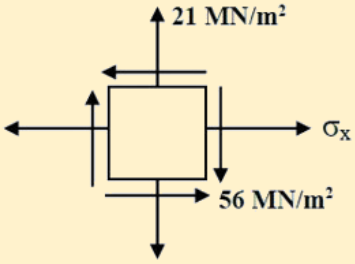


The upward deflection of the tip of the aircraft wing under the given loading can be expressed as:

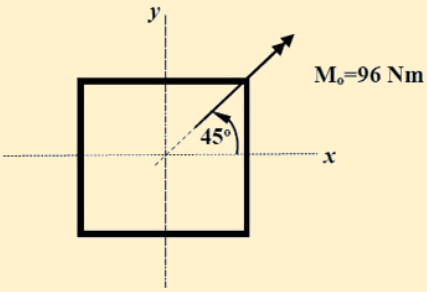
$$\delta = k\frac{Wl^3}{EI}$$

The value of k is _____ (in three decimal places).

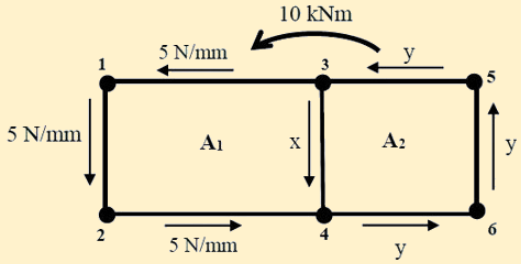
52) For the state of plane stress shown in the figure, the minimum principal stress is -7 MN/m^2. The normal stress σ_x in MN/m^2 is equal to _____ (in three decimal places).



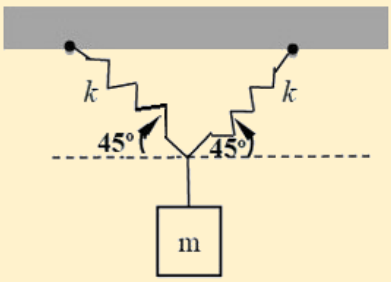
53) The maximum normal stress in MN/m² for the thin walled beam of square cross section of outer dimension 120 mm×120 mm and wall thickness 1 mm under the action of Moment $M_0 = 96$ Nm as shown in the figure is _____ (in three decimal places).



54) The idealized cross section of a thin-walled wing box structure shown in the figure is subjected to an anti-clockwise torque of 10 KNm. The corresponding shear-flow distribution under this loading condition is shown in the figure. The area of each cell is $A_1 = 300 \times 10^3$ mm², $A_2 = 250 \times 10^3$ mm², The ratio of the $\frac{x}{y}$ is given by _____ (in three decimal places).



55) The natural frequency of the system suspended by two identical springs of stiffness k is as shown in the figure is given by $\omega_n = a\sqrt{\frac{k}{m}}$ for small displacement. Both the springs make an angle of 45° with the horizontal. The value of a is _____ (in two decimal places).



General Aptitude

Q.56 – Q.60 carry one mark each.

56) The ninth and tenth of this month are Monday and Tuesday _____

(A) figuratively (B) retrospectively

(C) respectively (D) rightfully

57) It is _____ to read this year's textbook _____ the last year's.

(A) easier, than (B) most easy, than
(C) easier, from (D) easiest, from

58) A rule states that in order to drink beer, one must be over 18 years old. In a bar, there are 4 people. P is 16 years old, Q is 25 years old, R is drinking milk shake and S is drinking a beer. What must be checked to ensure that the rule is being followed?
(A) Only P's drink
(B) Only P's drink and S's age
(C) Only S's age
(D) Only P's drink, Q's drink and S's age

59) Fatima starts from point P goes north for 3 km, and then East for 4 km to reach point Q. She then turns to face point P and goes 15 km in that direction. She then goes North for 6 km. How far is she from point P, and in which direction should she go to reach point P?

(A) 8 km, East (B) 12 km, North
(C) 6 km, East (D) 10 km, North

60) 500 students are taking one or more courses out of Chemistry, Physics and Mathematics. Registration records indicate course enrolment as follows: Chemistry (329), Physics (186), Mathematics (295), Chemistry and physics (83), Chemistry and Mathematics (217), and Physics and Mathematics (63). How many students are taking all 3 subjects?

(A) 37 (B) 43
(C) 47 (D) 53

Q.61 – Q.65 carry TWO marks each

61) "If you are looking for a history of India, or for an account of the rise and fall of the British Raj, or for the reason of the cleaving of the subcontinent into two mutually antagonistic parts and the effects this mutilation will have in the respective sections, and ultimately on Asia, you will not find it in these pages; for though I have spent a lifetime in the country, I lived too near the seats of events, and was too intimately associated with the actors, to get the perspective needed for the impartial recording of these matters"
Which of the following statements best reflects the author's opinion?
(A) An intimate association does not allow for the necessary perspective.
(B) Matters are recorded with an impartial perspective.
(C) An intimate association offers an impartial perspective.
(D) Actors are typically associated with the impartial recording of matters.

62) Each of P, Q, R, S, W, X, Y and Z have been married at most once. X and Y are married and have two children P and Q. Z is the grandfather of the daughter S of P. Further, Z and W are married and are parents of R. Which one of the following must necessarily be FALSE?
(A) X is the mother-in-law of R
(B) P and R are not married to each other
(C) P is son of X and Y
(D) Q cannot be married to R

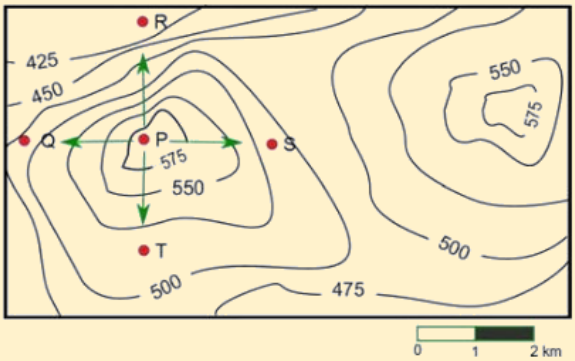
63) 1200 men and 500 women can build a bridge in 2 weeks. 900 men and 250 women will take 3 weeks to build the same bridge. How many men will be needed to build the bridge in one week?

(A) 3000 (B) 3300
(C) 3600 (D) 3900

64) The no. of 3-digit numbers such that the digit 1 is never to the immediate right of 2 is

(A) 781 (B) 791
(C) 881 (D) 891

65) A contour line joins locations having the same height above the mean sea level. The following is a contour plot of a geographical region. Contour lines are shown at 25 m intervals in this plot



Which of the following is the steepest path leaving from P?

(A) P to Q (B) P to R
(C) P to S (D) P to T

END OF THE QUESTION PAPER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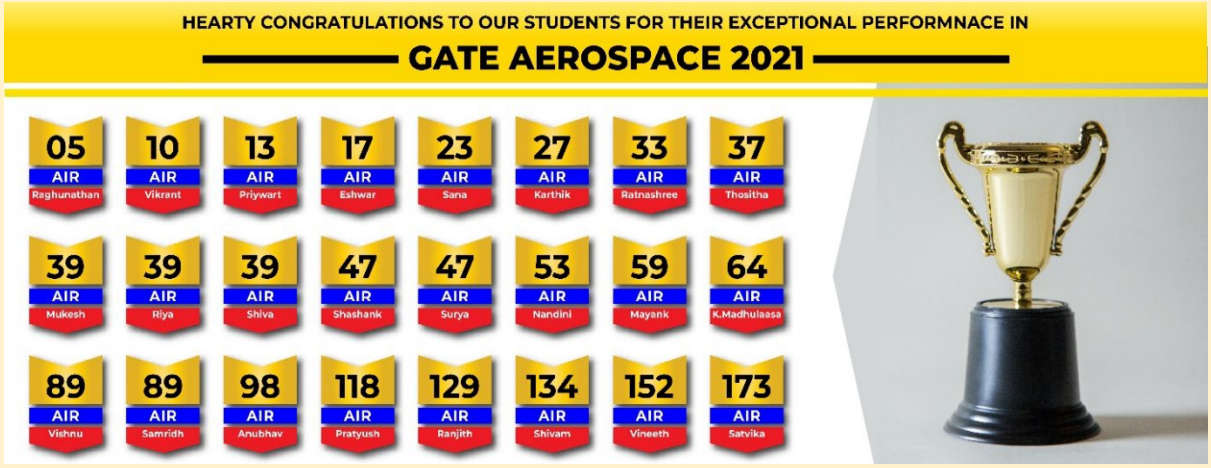
118 AIR K somesh
134 AIR Sri Sai
140 AIR Spandan
148 AIR Bala V
162 AIR Bhagya Lakshmi
173 AIR Riya
189 AIR Ravi
226 AIR Megha
258 AIR Dhruv
328 AIR Dinesh
339 AIR Veeresh
390 AIR Ritu Raj
404 AIR Pradeep
486 AIR Girish
626 AIR Mandeep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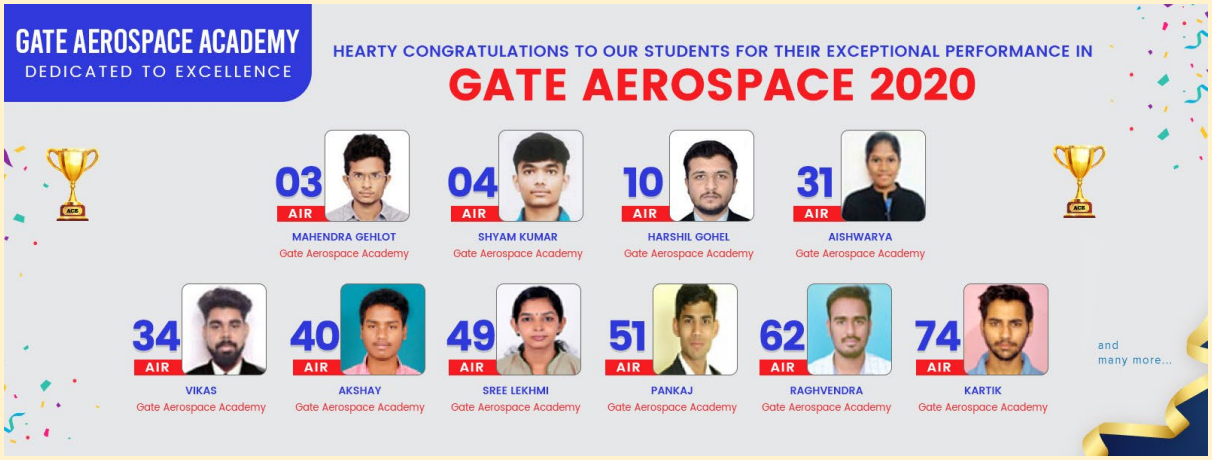
129 AIR Ranjith
134 AIR Shivam
152 AIR Vineeth
173 AIR Satvika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51 AIR
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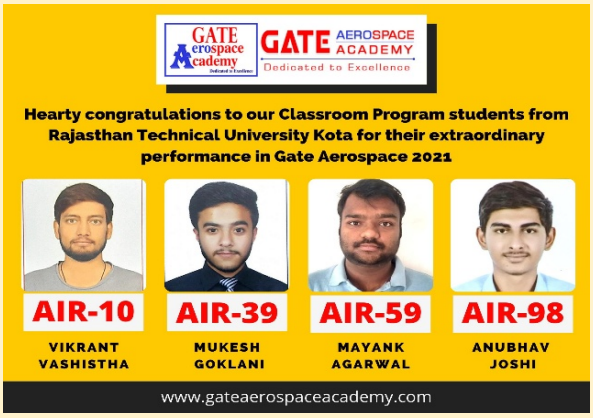
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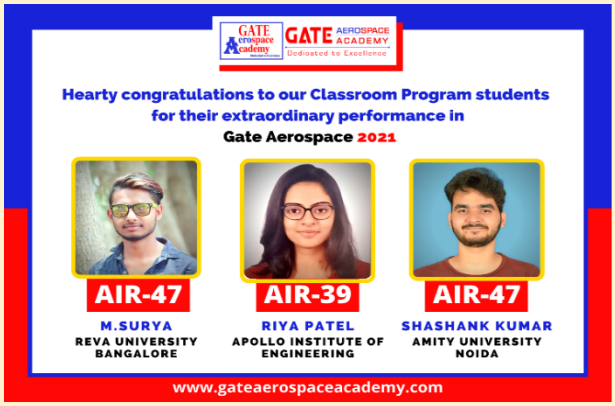
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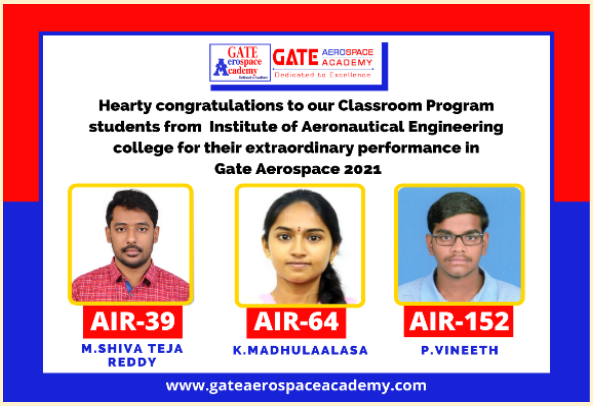
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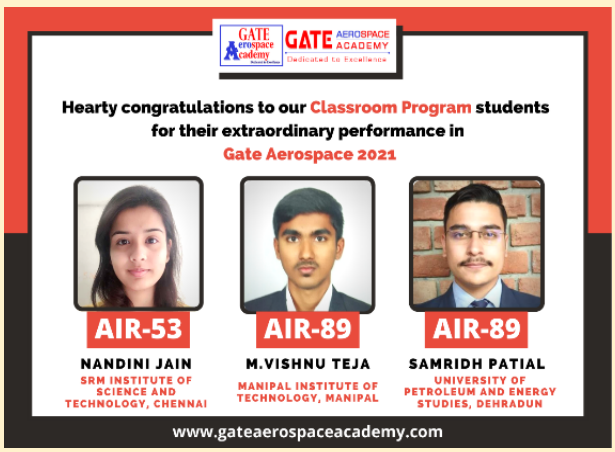
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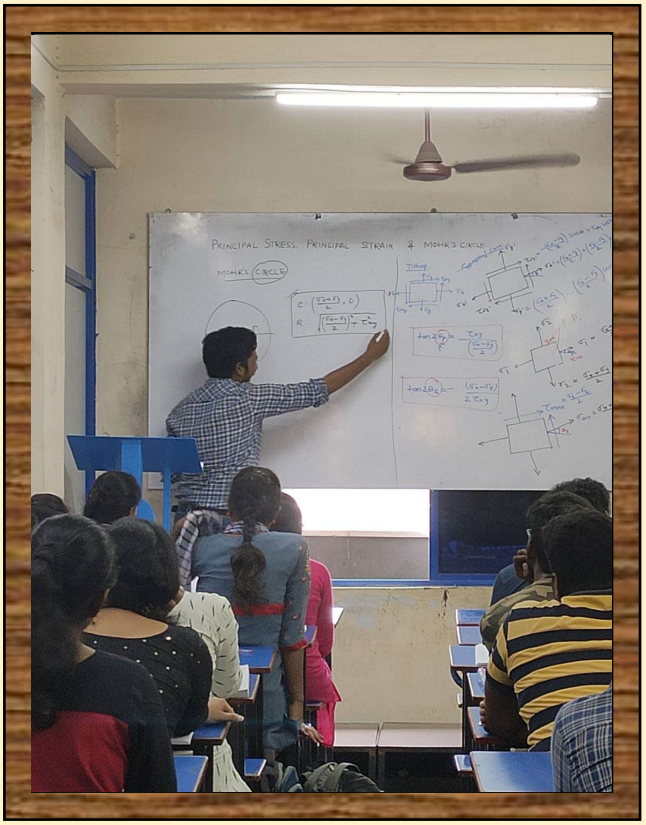
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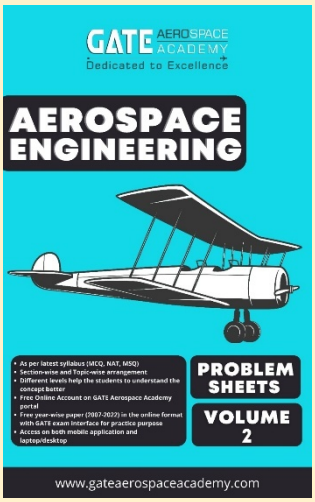
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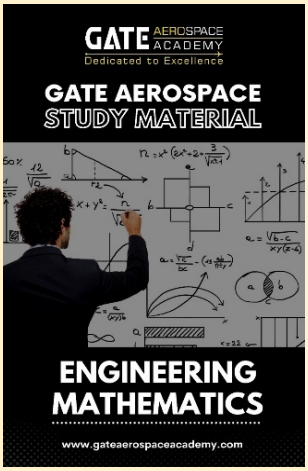
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