AE : AEROSPACE ENGINEERING

Duration: Three Hours *Maximum Marks*

Read the following instructions carefully.

1. This question paper contains **16** pages including blank pages for rough work. Please check all pages and report discrepancy, if any.
2. Write your registration number, your name and name of the examination centre at the specified locations on the right half of the Optical Response Sheet (**ORS**).
3. Using HB pencil, darken the appropriate bubble under each digit of your registration number and the letters corresponding to your paper code.
4. All questions in this paper are of objective type.
5. Questions must be answered on the **ORS** by darkening the appropriate bubble (marked A, B, C, D) using HB pencil against the question number on the left hand side of the ORS. **For each question darken the bubble of the correct answer.** In case you wish to change an answer, erase the old answer completely. More than one answer bubbled against a question will be treated as an incorrect response.
6. There are a total of 65 questions carrying 100 marks.
7. Questions Q.1 – Q.25 will carry 1-mark each, and questions Q.26 – Q.55 will carry 2-marks each.
8. Questions Q.48 – Q.51 (2 pairs) are common data questions and question pairs (Q.52, Q.53) and (Q.54, Q.55) are linked answer questions. The answer to the second question of the linked answer questions depends on the answer to the first question of the pair. If the first question in the linked pair is wrongly answered or is un-attempted, then the answer to the second question in the pair will not be evaluated.
9. Questions Q.56 – Q.65 belong to General Aptitude (GA). Questions Q.56 – Q.60 will carry 1-mark each, and questions Q.61 – Q.65 will carry 2-marks each. The GA questions will begin on a fresh page starting from page **11**.
10. Un-attempted questions will carry zero marks.
11. Wrong answers will carry **NEGATIVE** marks. For Q.1 – Q.25 and Q.56 – Q.60, ⅓ mark will be deducted for each wrong answer. For Q.26 – Q.51 and Q.61 – Q.65, ⅔ mark will be deducted for each wrong answer. The question pairs (Q.52, Q.53), and (Q.54, Q.55) are questions with linked answers. There will be negative marks only for wrong answer to the first question of the linked answer question pair i.e. for Q.52 and Q.54, ⅔ mark will be deducted for each wrong answer. There is no negative marking for Q.53 and Q.55.
12. Calculator (without data connectivity) is allowed in the examination hall.
13. Charts, graph sheets or tables are NOT allowed in the examination hall.
14. Rough work can be done on the question paper itself. Additionally, blank pages are provided at the end of the question paper for rough work.

SEAL

Q.1 – Q.25 carry one mark each.

Q.1 Isentropic efficiency η_d of a subsonic diffuser is defined as
(Note: 'a' represents the ambient, '2' represents the exit of the diffuser and 's' represents a isentropic process)

(A) $\frac{T_{02s}-T_a}{T_{02}-T_a}$ (B) $\frac{T_{02s}+T_a}{T_{02}+T_a}$ (C) $\frac{P_{02s}-P_a}{P_{02}-P_a}$ (D) $\frac{P_a-P_{02s}}{P_a-P_{02}}$

Q.2 Two position vectors are indicated by $\overline{V}_1=\begin{Bmatrix}x_1\\ y_1\end{Bmatrix}$ and $\overline{V}_2=\begin{Bmatrix}x_2\\ y_2\end{Bmatrix}$. If $a^2+b^2=1$, then the operation $\overline{V}_2=\begin{bmatrix}a & -b\\ b & a\end{bmatrix}\overline{V}_1$ amounts to obtaining the position vector $\overline{V}_2$ from $\overline{V}_1$ by

(A) translation
(B) rotation
(C) magnification
(D) combination of translation, rotation, and magnification.

Q.3 An aircraft is climbing at a constant speed in a straight line at a steep angle of climb. The load factor it sustains during the climb is:

(A) equal to 1.0
(B) greater than 1.0
(C) positive but less than 1.0
(D) dependant on the weight of the aircraft

Q.4 In a general case of a homogeneous material under thermo-mechanical loading the number of distinct components of the state of stress is

(A) 3 (B) 4 (C) 5 (D) 6

Q.5 The linear second order partial differential equation $5\frac{\partial^2\phi}{\partial x^2}+3\frac{\partial^2\phi}{\partial x\partial y}+2\frac{\partial^2\phi}{\partial y^2}+9=0$ is

(A) Parabolic (B) Hyperbolic (C) Elliptic (D) None of the above

Q.6 All other factors remaining constant, if the weight of an aircraft increases by 30% then the takeoff distance increases by approximately:

(A) 15% (B) 30% (C) 70% (D) 105%

Q.7 A vertical slender rod is suspended by a hinge at the top and hangs freely. It is heated until it attains a uniform temperature, T. Neglecting the effect of gravity, the rod has

(A) Stress but no strain
(B) Strain but no stress
(C) Both stress and strain
(D) Neither stress nor strain

Q.8 An aircraft stalls at a speed of 40 m/s in straight and level flight. The slowest speed at which this aircraft can execute a level turn at a bank angle of 60 degrees is:

(A) 28.3 m/s (B) 40.0 m/s (C) 56.6 m/s (D) 80.0 m/s

Q.9 The eigen-values of a real symmetric matrix are always

(A) positive
(B) imaginary
(C) real
(D) complex conjugate pairs

Q.10 The concentration x of a certain chemical species at time t in a chemical reaction is desc[...] differential equation $\frac{dx}{dt}+kx=0$, with $x(t=0)=x_0$. Given that e is the base of the [...] logarithms, the concentration x at $t=\frac{1}{k}$

(A) falls to the value $0.5x_0$ (B) rises to the value $2x_0$

(C) falls to the value $\frac{x_0}{e}$ (D) rises to the value ex_0

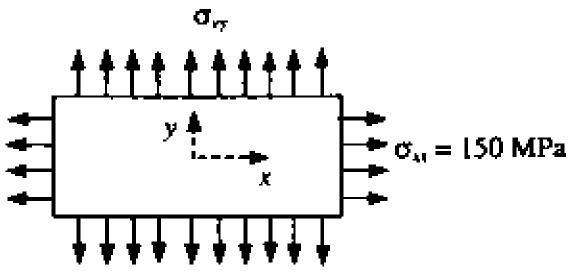
Q.11 The definite integral $\int_{-1}^{+1}\frac{dx}{x^2}$

(A) does not exist (B) is equal to 2 (C) is equal to 0 (D) is equal to -2

Q.12 The absolute ceiling of an aircraft is the altitude above which it:

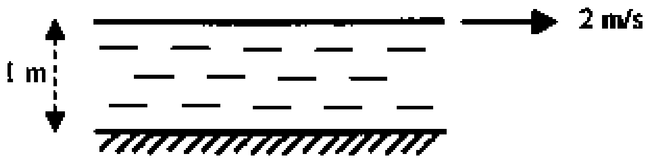
(A) can never reach
(B) cannot sustain level flight at a constant speed
(C) can perform accelerated flight as well as straight and level flight at a constant speed
(D) can perform straight and level flight at a constant speed only

Q.13 A thin rectangular plate made of isotropic material which satisfies the octahedral (*i.e.*, Von Mises/ Distortion energy) failure criterion has yield strength of 200 MPa under uniaxial tension. As shown in the figure, if it is loaded with uniform tension of 150 MPa along the x-direction, the maximum uniform tensile stress that can be applied along the y-direction before the plate starts yielding is about



(A) 227 MPa (B) 77 MPa (C) 87 MPa (D) 114 MPa

Q.14 Consider an incompressible 2-D Couette flow of water between two walls spaced 1m apart. The lower wall is kept stationary. What is the shear stress acting on the lower wall if the upper wall is moving at a constant speed of 2 m/s? ($\mu_{water}=7\times10^{-3}\,\text{N.s/m}^2$)



(A) $3.5\times10^{-3}\,\text{N/m}^2$ (B) $7\times10^{-3}\,\text{N/m}^2$ (C) $10.5\times10^{-3}\,\text{N/m}^2$ (D) $14\times10^{-3}\,\text{N/m}^2$

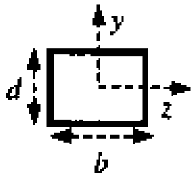
Q.15 The angular momentum, about the centre of mass of the earth, of an artificial satellite in a highly elliptical orbit is :

(A) a maximum when the satellite is farthest from the earth
(B) a constant
(C) proportional to the speed of the satellite
(D) proportional to the square of the speed of the satellite

Q.16 A column of length l and flexural rigidity EI, has one end fixed and the other end critical buckling load for the column is

(A) $\frac{\pi^2 EI}{(0.5l)^2}$ (B) $\frac{\pi^2 EI}{(0.7l)^2}$ (C) $\frac{\pi^2 EI}{l^2}$ (D) $\frac{\pi^2 EI}{(2l)^2}$

Q.17 A horizontal cantilevered steel beam of rectangular cross-section having width b and depth d is vibrating in the vertical plane. The natural frequency of bending vibration is highest when



(A) $b = 10, d = 10$ (B) $b = 20, d = 5$ (C) $b = 5, d = 20$ (D) $b = 25, d = 4$

Q.18 Consider an incompressible 2-D viscous flow over a curved surface. Let the pressure distribution on the surface be $p(s) = 2 + \sin\left(\frac{\pi}{2} + s\right) \text{N/m}^2$, where s is the distance along the curved surface from the leading edge. The flow separates at

(A) $s = (2/3)\pi$ m (B) $s = (3/2)\pi$ m (C) $s = (\pi/2)$ m (D) $s = \pi$ m

Q.19 For a multi-stage axial compressor with constant diameter hub

(A) Blade height decreases in the flow direction
(B) Blade height increases in the flow direction
(C) Blade height remains constant
(D) Blade height first increases and then decreases in the flow direction

Q.20 In a 2-D, steady, fully developed, laminar boundary layer over a flat plate, if x is the stream-wise coordinate, y is the wall normal coordinate and u is the stream-wise velocity component, which of the following is true:

(A) $\frac{\partial u}{\partial x} >> \frac{\partial u}{\partial y}$ (B) $\frac{\partial u}{\partial y} >> \frac{\partial u}{\partial x}$ (C) $\frac{\partial u}{\partial x} = \frac{\partial u}{\partial y}$ (D) $\frac{\partial u}{\partial x} = -\frac{\partial u}{\partial y}$

Q.21 How does the specific thrust, at constant turbine inlet temperature, produced by a turbofan engine change with an increase in compressor pressure ratio?

(A) Increases
(B) Decreases
(C) First increases and then decreases
(D) First decreases and then increases

Q.22 If ϕ is the potential function for an incompressible irrotational flow, and u and v are the Cartesian velocity components, then which one of the following combinations is correct?

(A) $u = \frac{\partial \phi}{\partial x}$, $v = \frac{\partial \phi}{\partial x}$
(B) $u = -\frac{\partial \phi}{\partial y}$, $v = \frac{\partial \phi}{\partial x}$
(C) $u = -\frac{\partial \phi}{\partial y}$, $v = \frac{\partial \phi}{\partial y}$
(D) $u = \frac{\partial \phi}{\partial x}$, $v = \frac{\partial \phi}{\partial y}$

Q.23 Among the choices given below, the Specific Impulse is maximum for a

(A) Cryogenic Rocket
(B) Solid Rocket
(C) Liquid Rocket
(D) Ramjet

Q.24 For a flow across an oblique shock which of the following statements is true?

(A) Component of velocity normal to shock decreases while tangential component increases.
(B) Component of velocity normal to shock increases while tangential component decreases.
(C) Component of velocity normal to shock is unchanged while tangential component decreases.
(D) Component of velocity normal to shock decreases while tangential component is unchanged.

Q.25 The maximum operating flow rate through a centrifugal compressor at a given RPM is limited by

(A) Impellor stall
(B) Surge
(C) Choking of diffuser throat
(D) Inlet flow distortion

Q.26 – Q.55 carry two marks each.

Q.26 A spacecraft of mass 100 kg, moving at an instantaneous speed of 1.8×10^4 m/s, picks up interstellar dust at the rate of 3.2×10^{-8} kg/s. Assuming that the dust was initially at rest, the instantaneous rate of retardation of the spacecraft is:

(A) 7.9×10^{-8} m/s^2
(B) 2.3×10^{-3} m/s^2
(C) zero
(D) 5.8×10^{-6} m/s^2

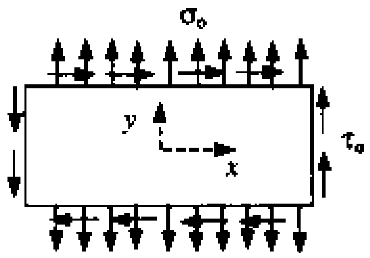
Q.27 Following stress state is proposed for a 2-D problem with no body forces: $\sigma_{xx} = 3x^2y + 4y^2$, $\sigma_{yy} = y^3 + 14xy$, $\tau_{xy} = -3xy^2 - 7x^2$. It satisfies

(A) Equilibrium equations but not compatibility equation
(B) Compatibility equation but not equilibrium equations
(C) Neither equilibrium equations nor compatibility equation
(D) Both equilibrium equations and compatibility equation

Q.28 A uniform cross-section rigid rod of mass m and length l, is hinged at its upper end and suspended like a pendulum. Its natural frequency for small oscillations is

(A) $\sqrt{\frac{g}{2l}}$
(B) $\sqrt{\frac{g}{l}}$
(C) $\sqrt{\frac{2g}{l}}$
(D) $\sqrt{\frac{3g}{2l}}$

Q.29 The thin rectangular plate shown in the figure is loaded with uniform shear, τ_o, along all edges and uniform uniaxial tension in the y-direction. The appropriate Airy's stress function to solve for stresses is given by

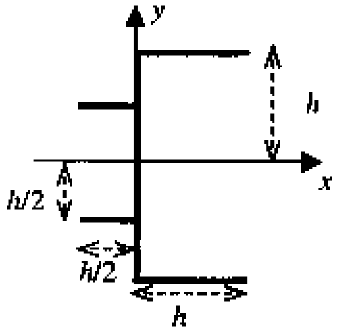


(A) $-\tau_o xy - \sigma_o \frac{x^2}{2} + \sigma_o(x^4 - y^4)$
(B) $\tau_o xy - \sigma_o \frac{x^2}{2}$
(C) $-\tau_o xy + \sigma_o \frac{x^2}{2}$
(D) $\tau_o xy + \sigma_o \frac{x^2}{2} + \sigma_o(x^4 - y^4)$

Q.30 A propeller powered aircraft, trimmed to attain maximum range and flying in a straigh... a distance R from its take-off point when it has consumed a weight of fuel equal to ... take-off weight. If the aircraft continues to fly and consumes a total weight of fuel equal to ... its take-off weight, the distance between it and its take-off point becomes:

(A) 2.5 R (B) 3.1 R (C) 2.1 R (D) 3.9 R

Q.31 The given thin wall section of uniform thickness, t, is symmetric about x-axis. Moment of inertia is given to be $I_{xx} = \frac{35}{12}th^3$. Shear center for this section is located at



(A) $x = -\frac{3}{8}h$ (B) $x = -\frac{9}{28}h$ (C) $x = -\frac{35}{36}h$ (D) $x = -\frac{17}{35}h$

Q.32 During an under-damped oscillation of a single degree of freedom system, in the time-displacement plot the third peak is of magnitude 100 and the tenth peak is of magnitude 10. The damping ratio ζ is approximately:

(A) 0.052 (B) 0.023 (C) 0.366 (D) 0.159

Q.33 Given that the Laplace transform of $y(t) = e^{-t}(2\cos 2t - \sin 2t)$ is $Y(s) = \frac{2s}{(s+1)^2+4}$, the Laplace transform of $y_1(t) = e^{t}(2\cos 2t - \sin 2t)$ is

(A) $\frac{2(s-2)}{(s-1)^2+4}$ (B) $\frac{2(s+2)}{(s+3)^2+4}$ (C) $\frac{2(s+2)}{(s+1)^2+4}$ (D) $\frac{2(s-1)}{(s-1)^2+4}$

Q.34 In a certain region a hill is described by the shape $z(x,y) = \frac{1}{50}x^4 + y^2 - xy - 3y$, where the axes x and y are in the horizontal plane and axis z points vertically upward. If $\hat{i}$, $\hat{j}$ and $\hat{k}$ are unit vectors along x, y and z, respectively, then at the point $x = 5, y = 10$ the unit vector in the direction of the steepest slope of the hill will be:

(A) $\hat{i}$ (B) $\hat{j}$ (C) $\hat{k}$ (D) $\hat{i}+\hat{j}+\hat{k}$

Q.35 An aircraft is cruising at an altitude of 9 km. The free-stream static pressure and density at this altitude are 3.08×10^4 N/m^2 and 0.467 kg/m^3 respectively. A Pitot tube mounted on the wing senses a pressure of 3.31×10^4 N/m^2. Ignoring compressibility effects, the cruising speed of the aircraft is approximately

(A) 50 m/s (B) 100 m/s (C) 150 m/s (D) 200 m/s

Q.36 The trim curves of an aircraft are of the form $C_{m_{cg}} = (0.05 - 0.2\delta_e) - 0.1C_L$ where deflection angle, δ_e, is in radians. The static margin of the aircraft is :

(A) 0.5 (B) 0.2 (C) 0.1 (D) 0.05

Q.37 The function $f(x, y) = x^2 + y^2 - xy - 3y$ has an extremum at the point

(A) (1,2) (B) (3,0) (C) (2,2) (D) (1,1)

Q.38 Consider the flow of air ($\rho = 1.23$ kg/m^3) over a wing of chord length 0.5 m and span 3 m. Let the free stream velocity be $U = 100$ m/s and the average circulation around the wing be $\Gamma = 10$ m^2/s per unit span. The lift force acting on the wing is

(A) 615 N (B) 1845 N (C) 3690 N (D) 4920 N

Q.39 The stagnation pressure and stagnation temperature inside the combustion chamber of a liquid rocket engine are 1.5 MPa and 2500 K respectively. The burned gases have γ = 1.2 and R = 692.83 J/kgK. The rocket has a converging - diverging nozzle with a throat area of 0.025 m^2 and the flow at the exit of the nozzle is supersonic. If the flow through the nozzle is isentropic, what is the mass flow rate of the gases out of the nozzle?

(A) 18.5 kg/s (B) 31.2 kg/s (C) 29.7 kg/s (D) 19.4 kg/s

Q.40 In finding a root of the equation: $x^2 - 6x + 5 = 0$ the Newton-Raphson method achieves an order of convergence equal to:

(A) 1.0 (B) 1.67 (C) 2.0 (D) 2.5

Q.41 Consider a 1-D adiabatic, inviscid, compressible flow of air ($R = 287$ J/Kg-K, $c_v = 718$ J/Kg-K) through a duct of constant cross-sectional area $A = 1$ m^2. If the volumetric flow rate is $Q = 680$ m^3/s and stagnation temperature is $T_0 = 580.05$ K, then the air temperature inside the duct is

(A) 300 K (B) 350 K (C) 400 K (D) 450 K

Q.42 A two stage chemical rocket, having the same specific impulse (I_{sp}) of 300 s for both the stages is designed in such a way that the payload ratio and the structural ratio are same for both the stages. The second stage of the rocket has following mass distribution :
Propellant Mass = 10208 kg
Structural Mass = 1134 kg
Payload Mass = 1700 kg
g_e = 9.8 m/s^2

If the rocket is fired from rest and it flies in a zero gravity field and a drag free environment, the final velocity attained by the payload is

(A) 9729.3 m/s (B) 897.3 m/s (C) 9360.2 m/s (D) 8973.2 m/s

Q.43 A missile with a Ramjet engine is flying in air. The temperature at the inlet and the outlet of the combustor are 1200 K and 2500 K respectively. The heating value of the fuel is 43 MJ/kg and the burner efficiency is 90%. Considering the working fluid to be air (C_P = 1005 J/kgK and γ = 1.4), the fuel/air ratio ($f = \frac{\dot{m}_f}{\dot{m}_a}$) for this engine is equal to:

(A) 0.032 (B) 0.036 (C) 0.042 (D) 0.026

Q.44 The trim curves of an aircraft are of the form $C_{m_{cg}} = (0.05-0.2\delta_e)-0.1C_L$ where deflection angle, δ_e, is in radians. The change in elevator deflection needed to increase coefficient from 0.4 to 0.9 is :

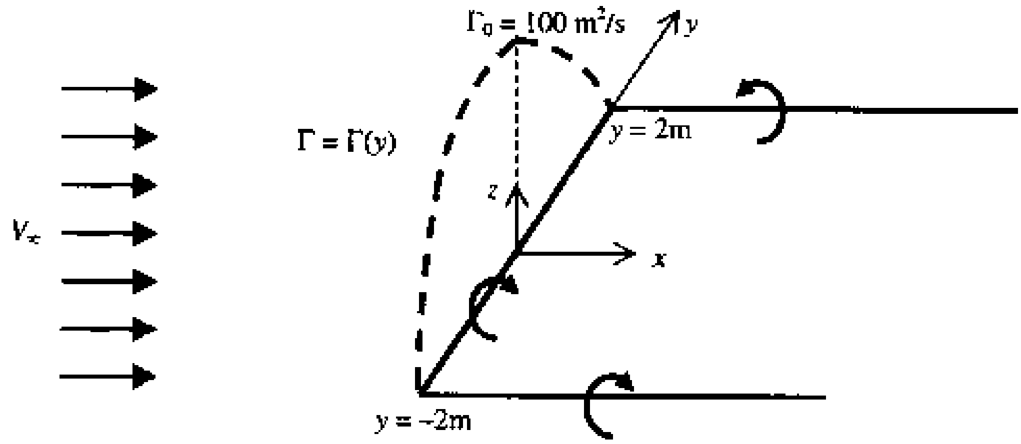
(A) -0.5 radians (B) -0.25 radians (C) 0.25 radians (D) 0.5 radians

Q.45 If e is the base of the natural logarithms then the equation of the tangent from the origin to the curve $y = e^x$ is

(A) $y = x$ (B) $y = \pi x$ (C) $y = \dfrac{x}{e}$ (D) $y = ex$

Q.46 Consider a potential flow over a finite wing with the following circulation distribution

$$\Gamma(y) = 100\sqrt{1-\left(\frac{2y}{4}\right)^2}\ \text{m}^2/\text{s}$$



If the free stream velocity is 100 m/s, the induced angle of attack is

(A) 0.125 radians

(B) -0.125 radians

(C) $0.125\sqrt{1-\left(\frac{y}{2}\right)^2}$ radians

(D) $-0.125\sqrt{1-\left(\frac{y}{2}\right)^2}$ radians

Q.47 The inlet stagnation temperature for a single stage axial compressor is 300 K and the stage efficiency is 0.80. Following conditions exist at the mean radius of the rotor blade:
Blade speed = 200 m/s
Axial flow velocity = 160 m/s
Inlet blade angle $\beta_1 = 44°$
Outlet blade angle $\beta_2 = 14°$
$C_P = 1005$ J/kgK and $\gamma = 1.4$

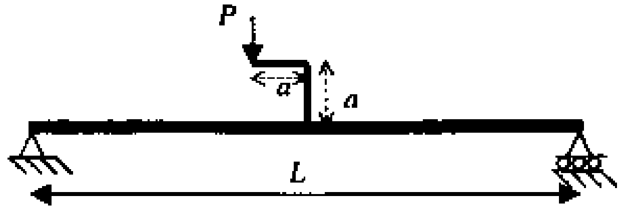
What is the stagnation pressure ratio (P_{RS}) for this compressor?

(A) 1.41 (B) 1.37 (C) 1.51 (D) 1.23

Common Data Questions

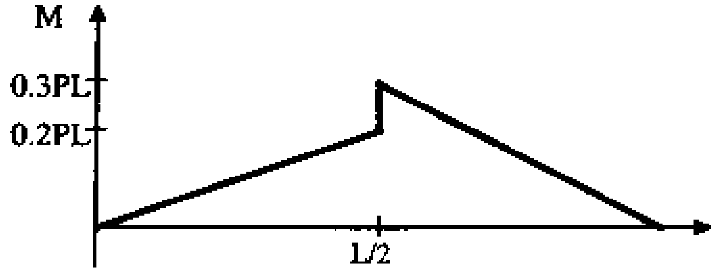
Common Data for Questions 48 and 49:

Consider a simply supported beam of length L, carrying a bracket welded at its center. The bracket car vertical load, P, as shown in the figure. Dimensions of bracket are a=0.1L. The beam has a square cro section of dimension $h \times h$.

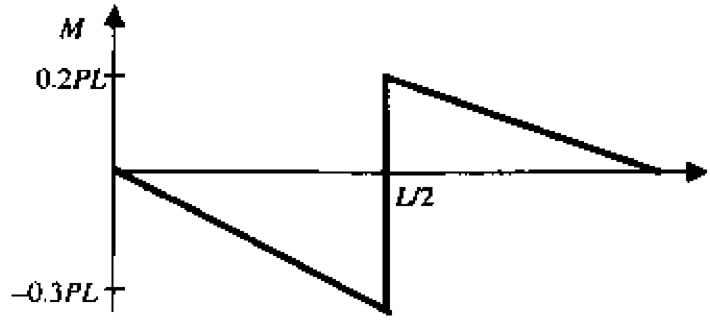


Q.48 Bending moment diagram is given by

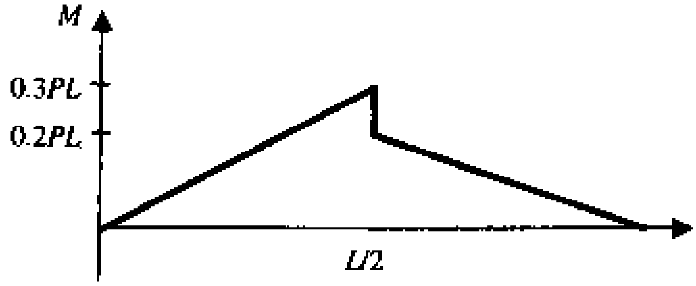
(A)



(B)



(C)



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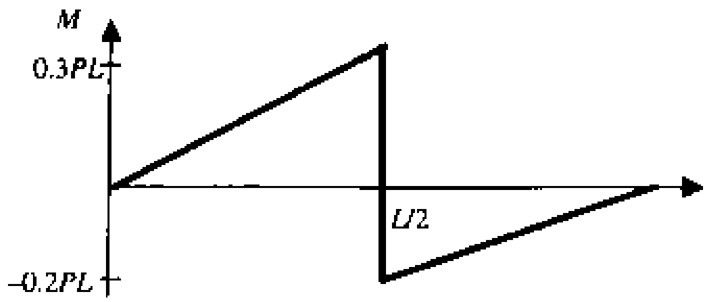


Q.49 Maximum value of shear stress is

(A) 0.67 P/h^2 (B) 1.33 P/h^2 (C) 1.5 P/h^2 (D) 0.9 P/h^2

Common Data for Questions 50 and 51:

Consider a potential flow over a spinning cylinder. The stream function is given as

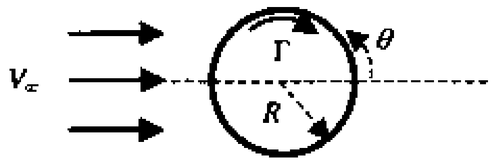
$$\psi = (V_\infty r \sin\theta)\left(1 - \frac{R^2}{r^2}\right) + \frac{\Gamma}{2\pi}\ln\frac{r}{R}$$

where

Free stream velocity, $V_\infty = 25$ m/s

Cylinder radius, $R = 1$ m

Circulation, $\Gamma = 50\pi$ m^2/s



Q.50 The radial and azimuthal velocities on the cylinder surface at $\theta = \pi/2$ are

(A) $V_r = 0$ m/s, $V_\theta = -75$ m/s (B) $V_r = 0$ m/s, $V_\theta = 75$ m/s

(C) $V_r = 0$ m/s, $V_\theta = -25$ m/s (D) $V_r = 0$ m/s, $V_\theta = 25$ m/s

Q.51 The stagnation points are located at

(A) 210° and 330° (B) 240° and 300° (C) 30° and 150° (D) 60° and 120°

Linked Answer Questions

Statement for Linked Answer Questions 52 and 53:

An aircraft with an IDEAL Turbojet engine is flying at 200 m/s at an altitude where the ambient pressure is equal to 0.8 bar. The stagnation pressure and temperature at the inlet of the turbine are 6 bar and 1400 K respectively. The change in specific enthalpy across the compressor is 335 kJ/kg. Assume the fuel flow rate to be very small in comparison to the air flow rate and consider $C_P = 1117$ J/kgK and $\gamma = 1.3$.

Q.52 What is the stagnation pressure at the inlet of the nozzle?

(A) 2.8 bar (B) 5.7 bar (C) 2.1 bar (D) 6.3 bar

Q.53 What is the specific thrust produced by this engine under the given conditions?

(A) 586 Ns/kg (B) 745 Ns/kg (C) 686 Ns/kg (D) 500 Ns/kg

Statement for Linked Answer Questions 54 and 55:

An aircraft is in straight and level flight at a constant speed v. It is disturbed by a symmetric vertical gust, resulting in a phugoid oscillation of time period T.

Q.54 Assuming that g is the acceleration due to gravity, T is given approximately by:

(A) $\frac{v}{\pi g}$ (B) $\frac{\pi v}{g}$ (C) $\frac{v}{\sqrt{2}\pi g}$ (D) $\frac{\sqrt{2}\pi v}{g}$

Q.55 If $v = 200$ m/s then the wavelength of the phugoid oscillations, assuming $g = 9.81$ m/s^2, is, approximately:

(A) 1.28×10^4 m (B) 1.30×10^3 m (C) 1.81×10^4 m (D) 918 m

General Aptitude (GA) Questions

Q.56 – Q.60 carry one mark each.

Q.56 *Which of the following options is the closest in meaning to the word below:*
Circuitous

(A) cyclic
(B) indirect
(C) confusing
(D) crooked

Q.57 *The question below consists of a pair of related words followed by four pairs of words. Select the pair that best expresses the relation in the original pair.*
Unemployed : Worker

(A) fallow : land
(B) unaware : sleeper
(C) wit : jester
(D) renovated : house

Q.58 *Choose the most appropriate word from the options given below to complete the following sentence:*
If we manage to _______________ our natural resources, we would leave a better planet for our children.

(A) uphold
(B) restrain
(C) cherish
(D) conserve

Q.59 *Choose the most appropriate word from the options given below to complete the following sentence:*
His rather casual remarks on politics _____________ his lack of seriousness about the subject.

(A) masked
(B) belied
(C) betrayed
(D) suppressed

Q.60 25 persons are in a room. 15 of them play hockey, 17 of them play football and 10 of them play both hockey and football. Then the number of persons playing neither hockey nor football is:

(A) 2 (B) 17 (C) 13 (D) 3

Q.61 – Q.65 carry two marks each.

Q.61 **Modern warfare has changed from large scale clashes of armies to suppression of civilian populations. Chemical agents that do their work silently appear to be suited to such warfare; and regretfully, there exist people in military establishments who think that chemical agents are useful tools for their cause.**

Which of the following statements best sums up the meaning of the above passage:

(A) Modern warfare has resulted in civil strife.
(B) Chemical agents are useful in modern warfare.
(C) Use of chemical agents in warfare would be undesirable.
(D) People in military establishments like to use chemical agents in war.

Q.62 If 137 + 276 = 435 how much is 731 + 672?

(A) 534 (B) 1403 (C) 1623 (D) 1513

Q.63 5 skilled workers can build a wall in 20 days; 8 semi-skilled workers can build a wall in 25 days; 10 unskilled workers can build a wall in 30 days. If a team has 2 skilled, 6 semi-skilled and 5 unskilled workers, how long will it take to build the wall?

(A) 20 days (B) 18 days (C) 16 days (D) 15 days

Q.64 Given digits 2, 2, 3, 3, 3, 4, 4, 4, 4 how many distinct 4 digit numbers greater than 3000 can be formed?

(A) 50 (B) 51 (C) 52 (D) 54

Q.65 Hari (H), Gita (G), Irfan (I) and Saira (S) are siblings (i.e. brothers and sisters). All were born on 1st January. The age difference between any two successive siblings (that is born one after another) is less than 3 years. Given the following facts:

i. Hari's age + Gita's age > Irfan's age + Saira's age.
ii. The age difference between Gita and Saira is 1 year. However, Gita is not the oldest and Saira is not the youngest.
iii. There are no twins.

In what order were they born (oldest first)?

(A) HSIG (B) SGHI (C) IGSH (D) IHSG

END OF THE QUESTION PAPER

Space for Rough Work

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