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1) For a flow through a Prandtl-Meyer expansion wave:

a) Mach number stays constant.
b) Entropy stays constant.
c) Temperature stays constant.
d) Density stays constant.

2) For two-dimensional irrotational and incompressible flows:
a) Both potential and stream functions satisfy the Laplace equation.
b) Potential function must satisfy the Laplace equation but the stream function need not.
c) Stream function must satisfy the Laplace equation but the potential function need not.
d) Neither the stream function nor the potential function need to satisfy the Laplace equation.

3) A trailing edge plain flap deflected downward increases the lift coefficient of an airfoil by
a) Increasing the effective camber of the airfoil.
b) Delaying the separation of the flow from the airfoil surface.
c) Increasing the local airspeed near the trailing edge.
d) Controlling the growth of the boundary layer thickness along the airfoil surface.

4) Thin airfoil theory predicts that the lift slope is $\frac{dc_l}{d\alpha} = 2\pi$ for:

a) Symmetric airfoils only.
b) Cambered airfoils only.
c) Any airfoil shape.
d) Joukowski airfoils only.

5) The ordinary differential equation $\frac{d^2y}{dx^2} + ky = 0$, where k is real and positive:
a) is non-linear.
b) has a characteristic equation with one real and one complex root.
c) has a characteristic equation with two real roots.
d) has a complementary function that is simple harmonic.

6) A non-trivial solution to the $(n \times n)$ system of equations $[A]\{x\} = \{0\}$, where $\{0\}$ is the null vector:
a) can never be found.
b) may be found only if $[A]$ is not singular.
c) may be found only if $[A]$ is an orthogonal matrix.
d) may be found only if $[A]$ has at least one eigenvalue equal to zero.

7) For a plane strain problem, the stresses satisfy the condition:
a) $\tau_{xz} = \tau_{yz} = \sigma_z = 0$
b) $\tau_{xz} = \tau_{yz} = 0, \sigma_z = \nu\left(\sigma_x + \sigma_y\right)$
c) $\tau_{xz} = \tau_{yz} = 0., \sigma_z = \nu\tau_{xy}$
d) $\tau_{xz} = \tau_{yz} = 0, \sigma_z = \nu\left(\sigma_x + \sigma_y\right) + (1 - \nu)\,\tau_{xy}$

8) The propulsive efficiency of a turbo-jet engine moving at velocity U_∞ and having exhaust velocity U_e with respect to the engine is given by:

a) $\frac{2}{U_\infty/U_e+1}$
b) $1 - \frac{U_\infty}{U_e}$
c) $\frac{2U_\infty U_e}{U_e^2+U_\infty^2}$
d) $\frac{2U_\infty}{U_e+U_\infty}$

9) An aircraft is flying at $M = 2$ where the ambient temperature around the aircraft is $250K$. If the specific heat ratio for air $\gamma = 1.4$, the stagnation temperature on the surface of the aircraft is:

a) $200K$ b) $450K$ c) $350K$ d) $1450K$

10) The division of feed air to an aircraft gas-turbine combustor into primary and secondary streams serves which of the following purposes?
P. A flammable mixture can be formed
Q. Cooling of combustor liner and flame tube can be accomplished
R. Specific fuel consumption can be reduced

a) P and R b) Q and R c) P and Q d) P,Q and R

11) Classify the following propellants as: cryogenic (C), semi-cryogenic (SC), compressed gas (CG), and earth storable (ES).
N_2O_4-UDMH (nitrogen tetra oxide and unsymmetrical di-methyl hydrazine)
LOX-RP1 (liquid oxygen and kerosene)
LOX-LH_2 (liquid oxygen and liquid hydrogen)
N_2 (nitrogen gas)

a) N_2O_4-UDMH (ES), LOX-RP1 (C), LOX-LH_2 (C), N_2 (C)
b) N_2O_4-UDMH (SC), LOX-RP1 (SC), LOX-LH_2 (C), N_2 (C)
c) N_2O_4-UDMH (ES), LOX-RP1 (SC), LOX-LH_2 (C), N_2 (CG)
d) N_2O_4-UDMH (ES), LOX-RP1 (C), LOX-LH_2 (C), N_2 (CG)

12) A conventional altimeter is a:

a) Pressure transducer
b) Temperature transducer
c) Density transducer
d) Velocity transducer