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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) $\tau_{xz} = \tau_{yz} = 0, \sigma_z = \nu(\sigma_x + \sigma_y)$
 - c) $\tau_{xz} = \tau_{yz} = 0, \sigma_z = \nu\tau_{xy}$
 - d) $\tau_{xz} = \tau_{yz} = 0, \sigma_z = \nu(\sigma_x + \sigma_y) + (1 - \nu)\tau_{xy}$
- 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-LH₂ (liquid oxygen and liquid hydrogen)

N_2 (nitrogen gas)

- a) N_2O_4 -UDMH (ES), LOX-RP1 (C), LOX-LH₂ (C), N_2 (C)
b) N_2O_4 -UDMH (SC), LOX-RP1 (SC), LOX-LH₂ (C), N_2 (C)
c) N_2O_4 -UDMH (ES), LOX-RP1 (SC), LOX-LH₂ (C), N_2 (CG)
d) N_2O_4 -UDMH (ES), LOX-RP1 (C), LOX-LH₂ (C), N_2 (CG)

12) A conventional altimeter is a:

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