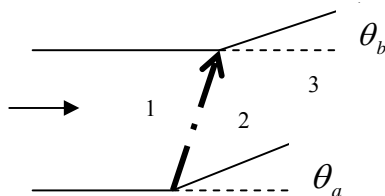


High-Speed Aerodynamics

QUIZ

1. What happens when an oblique shock or an acoustic wave hits a constant pressure boundary?
2. Why shock wave cannot form in an expanding flow?
3. Entropy changes in a flow produce vorticity – illustrate with examples.
4. Shock-expansion theory predicts the lift force acting on an airfoil in supersonic flows without considering the Kutta condition. How is the Kutta condition satisfied?
5. How does camber affect the lift coefficient of an airfoil in supersonic flow?
6. An airfoil in inviscid subsonic flow does not experience any drag force but it does in inviscid supersonic flow – why and how?
7. What is stagnation pressure?
8. A pitot tube does not measure the correct stagnation pressure in a supersonic stream. Why? How will you get the correct stagnation pressure from the pitot measurement?
9. What is thermal choking? What happens if heat is added to a thermally choked subsonic flow?
10. What causes the stagnation pressure loss in a gas turbine combustion chamber?
11. What are under- and over-expanded nozzle flows? What do you expect to happen in the jet that follows in each case?
12. What are the possible isentropic flows through a converging-diverging duct with fixed exit to throat area ratio connected to a fixed reservoir and back conditions?
13. Why do supersonic wind tunnels employ a second throat? How should the two throat areas compare?
14. How does a resistive force like friction accelerate a subsonic flow in ducts?
15. What is an unstarted intake diffuser?
16. Explain the phenomenon of ‘buzz’ in a supersonic intake.
17. If a plane acoustic wave of strength Δp is reflected from a closed end of a tube what will be the pressure there? If the end is open what will be the pressure then?
18. Consider the wave pattern shown in the sketch below. M_1 is 1.8 and θ_a is 3° . How much is θ_b ?



19. What are characteristics? Method of characteristics cannot be employed to solve incompressible flow – why?
20. Shocks in transonic flow are usually normal shocks – why?
21. What are the different flow zones in a shock tube? Illustrate with a sketch. What are the differences between the central zones?
22. What are similarity rules? How do they differ from dimensional analysis?
23. Does perfect gas have a critical temperature? If yes, how much is it?
24. Consider the wave pattern shown below. Find θ_1 and $\theta_2 - \theta_1$.

