SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E – Aeronautical
Title of the paper: Aerodynamics - II
Semester: V Max. Marks: 80
Sub.Code: 526502/626501 Time: 3 Hours
Date: 06-11-2008 Session: FN

PART – A (10 x 2 = 20)

Answer All the Questions

1. Sound Propagation is an isothermal Process True/False. Justify Your Answer.

2. Define Critical Mach No.

3. Define Characteristic Mach No.

4. What is area Rule?

5. What is Shock Polar?

6. Plot the shock polar in dimensionless form for an upstream Mach No. of Infinity.

7. How is a flow past a wedge different from flow past a cone?

8. Define Normal Shock and Oblique shocks.

9. What is Mach Wave?

10. Why Preheating of air is needed in Hypersonic Tunnels?

PART – B (5 x 12 = 60)

Answer All the Questions

11. Form the fundamental Principles derive an expression for speed of sound in terms of ratio of specific heats, Gas constant and flow temperature.

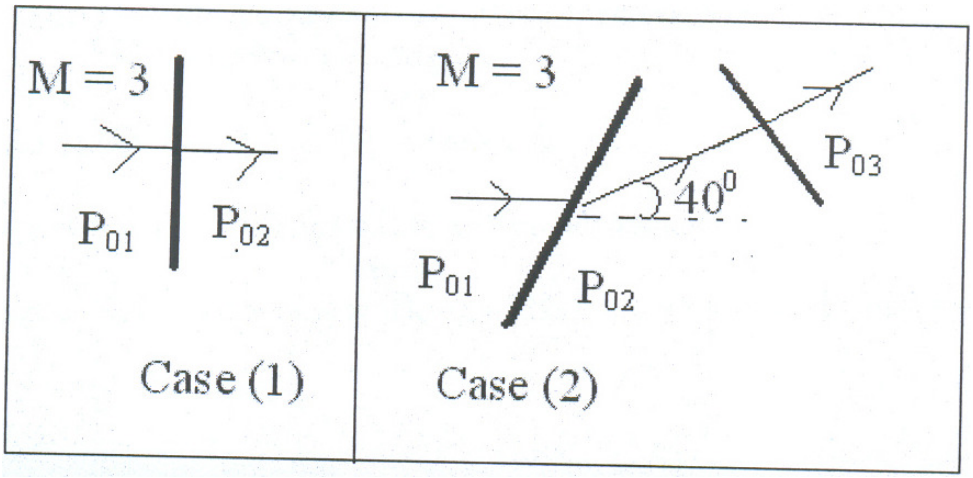
(or)

12. Discuss the performances of Nozzles under various Back Pressures.

13. It is required to decelerate a supersonic flow of Mach No.3 to a sub sonic speed. Consider two separate ways of achieving this.

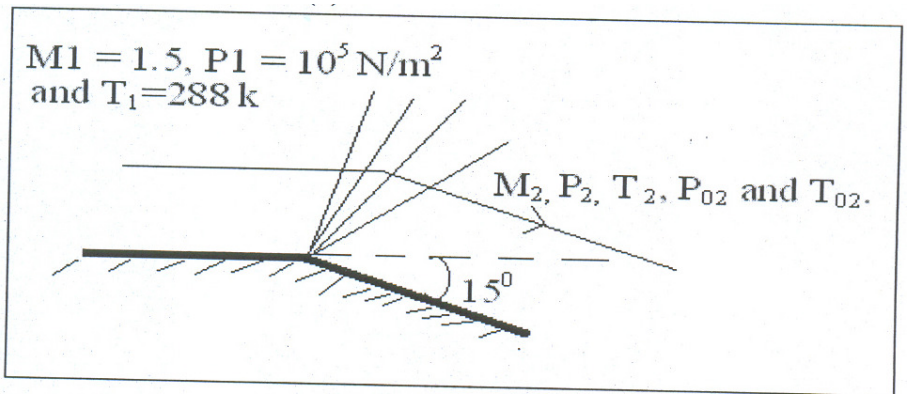
(a) The flow is slowed by passing directly through a normal shock.

(b) The flow first passes through an oblique shock with 40° wave angle and then below. Calculate the ratio P_{03}/ P_{01} for case 1 and 2. comment on the significance of the result.



(or)

14. (a) A supersonic Flow with M1 = 1.5, P1 = 10^5 N/m^2 and T_1 = 288 k is expanded around a sharp corner through a deflection angle of 15°. Calculate M_2, P_2, T_2, P_{02} and T_{02}. (8)



(b) Distinguish Between Expansion Waves and Shock Waves. (4)

15. (a) Derive the compressible flow Bernoulli's Equation form one Dimensional Euler's Equation. (8)

    (b) Define compressibility of a gas. (4)

(or)

16. (a) What are the salient features of "Liberalized Supersonic flow theory"? (8)

    (b) Define Upper Critical Mach No., Lower Critical Mach No. and Super Critical Aerofoil. (4)

17. Write short notes on:
    (a) Drag Divergence
    (b) Transonic area Rule
    (c) Compare and contrast swept forward and swept backward wings.

(or)

18. Explain Shock Polar with Neat Sketches.

19. Explain the schileran technique of flow visualization.

(or)

20. Explain Construction and working of Helium, gun tunnels and shock tubes.