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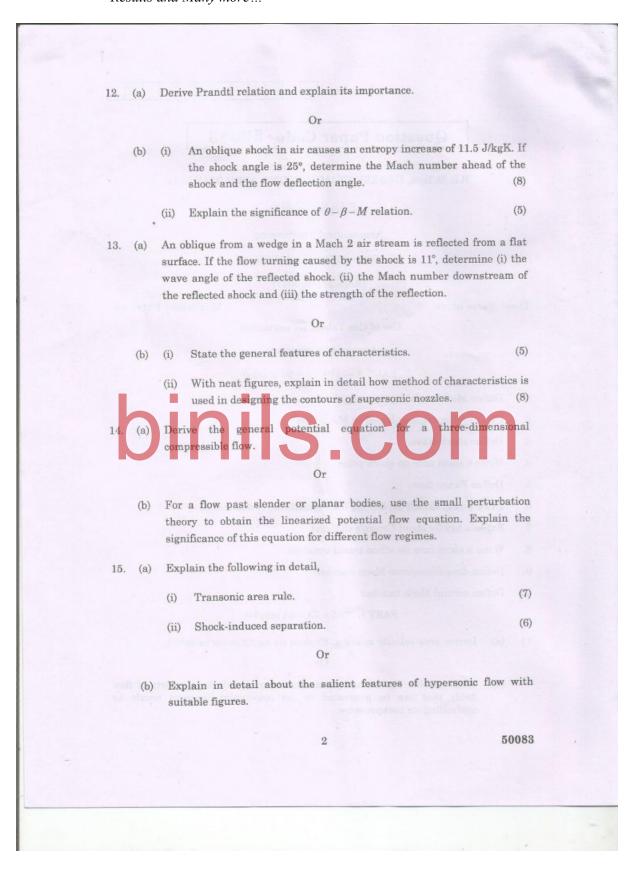
Reg. No.:
Question Paper Code: 50083
B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.
Fifth Semester
· Aeronautical Engineering
AE 8503 – AERODYNAMICS – II
(Regulations 2017)
Time: Three hours Maximum: 100 marks
Use of Gas Tables are permitted.
Answer ALL questions.
PART A — $(10 \times 2 = 20 \text{ marks})$
1. Define Mach angle.
<ol> <li>Classify flow regimes based on Mach number.</li> <li>Define shock wave.</li> <li>Write a short note on shock polar.</li> </ol>
5. Define Fanno flow.
6. Draw a neat sketch explaining the Prandtl-Meyer expansion.
7. Explain briefly about Crocco's theorem.
8. Write a short note on affine transformation.
9. Define drag-divergence Mach number.
10. Define critical Mach number
PART B — $(5 \times 13 = 65 \text{ marks})$
11. (a) Derive area-velocity relation. Explain its significance in detail.
Or
(b) With suitable figures and plots, explain in detail about variety of flow fields that can be generated in the convergent-divergent nozzle by controlling its backpressure.
EROPA

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PART C —  $(1 \times 15 = 15 \text{ marks})$ 

16. (a) A convergent\_-divergent nozzle of throat area 10 cm² and exit area 24 cm² is operated by an air storage tank at 300 kPa and 300K. Calculate the range of backpressure for which (i) the entire divergent portion will be supersonic, and (ii) the exit Mach number is less than 1. (iii) Are the mass flow and exit pressure independent of the backpressure?

Or

(b) At a particular section in a duct through which air is flowing adiabatically, the pressure, temperature and velocity are 2 atm, 10°C and 200 m/s, respectively. If the pressure and velocity at a downstream location are 1.5 atm and 250 m/s, calculate the Mach number and the stagnation pressure, density and temperature at the first location. Also, calculate the maximum velocity, sonic velocity and the stagnation pressure and density at station 2. What is the percentage pressure loss between stations 1 and 2. Assume flow to be incompressible.

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