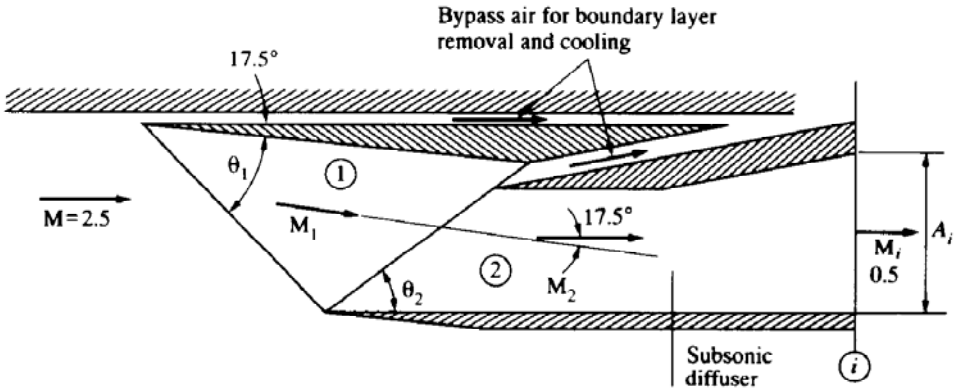
Homework
Due Date: 12 Day 1390

A new supersonic passenger aircraft is being designed for flight Mach number 2.5 at an altitude where the ambient pressure and temperature are 9 kPa and 220 K, respectively. The engine inlet configuration shown below allows for double oblique shock deceleration followed by a zone of subsonic deceleration. The Mach number is 0.5 at the engine inlet plane (*i*). Losses in the subsonic diffuser are neglected. Determine:

a. The Mach numbers M_1 and M_2 in the zones (1) and (2) shown on the drawing,
b. the wave angles θ_1 and θ_2, also shown on the drawing,
c. the overall stagnation pressure ratio p_{oi}/p_{oa},
d. the overall static pressure ratio p_i/p_a,
e. the velocity ratio c_i/c_2 for the subsonic diffuser, and
f. the cross-sectional area $A_i(m^2)$ at the engine inlet plane if the engine mass flow rate is 500 kg/s.



2- For the inlet shown below, M_D=2.5 and M_b=0.3, calculate M_3, P_3/P_a, P_b/P_3. Variations of r_d and η_d vs. Mach number for section (3-b) shown in the graph below.