MSc FINAL EXAM QUESTIONS

Gas Dynamics

G1. Derive the isentropic sound speed equation. Introduce Mach number and its density differential form.

G2. Describe the small body disturbances, the Mach waves. Classify flow regimes using Mach number, and their basic characteristics.

G3. Derive isentropic discharge speed (Saint Venant-Wantzel formula) and maximum discharge velocity. The consequences.

G4. Difference between the weak and strong shock waves. Show figures too, e.g. entropy – Mach number, Hugoniot curve.

G5. Describe the $\theta - \beta - M$ plot and its special cases. The formation of attached and detached OSW.

G6. Detached shock wave characteristics in front of the wedge-shaped body with afterbody.

G7. The $\theta - \beta - M$ behavior at very large inlet Mach number (inviscid hypersonic flow).

G8. Operating conditions of the convergent-divergent nozzle. Please draw operating curves and flow characteristics. Temperature and velocity behavior inside the nozzle in the fully supersonic case.