

AE 616/236: HW 1. Due 25/9/2024, 12 noon. Total=40

This is a **GRADED Group work** (see groupings on next page).

Submit a link to a Google Colab document of your work, including detailed explanation, code listing and the results as mentioned below. Make sure that the Colab workbook can be **EXECUTED** by all (TAs and me); please do verify this for hassle-free grading. Also, you have to submit a pdf created directly from the Google Colab document (for my ease of grading). Ensure that there is no loss of information in the export to pdf.

NB: A further 20 marks is allocated to the presentation of your work, to be held immediately after the submission deadline. The overall 60 marks will be scaled to 10% of your final grade.

1. (10 points) **Rayleigh Flow:** Derive a closed-form analytical expression for the Mach number in terms of the ratio of the total temperature to its diabatic sonic counterpart (i.e., T_0/T_0^*). Clearly identify the subsonic and supersonic solutions, with proper justification. Also, determine the ranges of T_0/T_0^* in which your equations are valid.
2. (10 points) **Rayleigh Flow:** Write a code (and run it) to reproduce the graph flashed in class showing the ratios of thermodynamic properties to their respective diabatic sonic counterparts (e.g., p/p^* , T/T^* , T_0/T_0^* , etc.) versus Mach number. Also reproduce the $T-s$ diagram flashed in class (with appropriate normalization).
3. (20 points) **Rayleigh Flow:** Code up your solution of the first question and reuse parts from the second solution to design and implement a function with appropriate arguments and outputs, such that you can solve typical Rayleigh flow problems. Make this function in such a way that you can use it to solve examples 3.13 and 3.14 of Anderson's textbook (2003 edition) (or any two examples of your choice that exercise both the subsonic and supersonic parts of your code). Hence validate your code, with the given solutions to these example problems.

Group	Roll No	Name
1	24m0003	Ambuj Nayan
	23m0035	Mahesh Vitthalrao Bayas
	23m1653	Mohit Dhaka
	24m0011	Aditya Nilesh Dhamne
	24m0055	Mayur Mayur
2	22b1833	Namala Aadarsh
	24m0032	Darsh Yogesh Butala
	24m0038	Rahul Giri
	24m0002	S Rishabh Kumar
3	24m0013	Manish Barle
	24m0031	Shivangi Dhawan
	23m0023	Manish Kumar
	210100137	Shiva Sudhan R
	24m0016	Mayank Kumar
4	23m0022	Apurva Danabhai Chavda
	24m0037	Yaragani Sai Goutham
	23m1634	Sumit Anand
	24m0034	Shravanth H R
5	190010050	Piyush Hemantkumar Gautam
	24m0039	Sachin Kumar
	24m0040	Manish Sunil Lakhode
	24m0058	Kushal Shanbhag Narcinva
6	24m0015	Ghanshyam Balasaheb Kadam
	24m0014	Sai Sitharth
	24m0004	Patel Jaydipkumar Lalitkumar
	24m0006	Ajaykumar Nandubhai Prajapati
7	24d0003	G Vijaya Lahari
	24m0007	Sanjeev Kumar
	24m0041	Yash Ganeshbhai Maturkar
	24m0012	Patel Arpeet Nileshkumar
	24m0035	Simran Simran
8	24m0005	Abisheik Visagan M
	24m0028	Prasham Mehul Doshi
	24m0010	Santhosh Kumar R
	24m0061	Kurapati Ruby
	23m1624	Sandeep Kumar Singh
9	24d0004	Nitesh Patidar
	24m0036	Guntupalli Venkata Sai
	24m0063	Nivethitha Nagarajan
	24m0059	Arpit Singhal
	24m0029	Soorya Sridhar
10	24m0008	Kodari Sravan
	24m0009	Vinay Kumar Vemulapati
	24m0065	Ram Naresh Mahato
	24m0001	Murali Krishna Y
	23m0036	Yarranagula Krishna Teja