Sanjay Ghodawat University, Kolhapur

2020-21

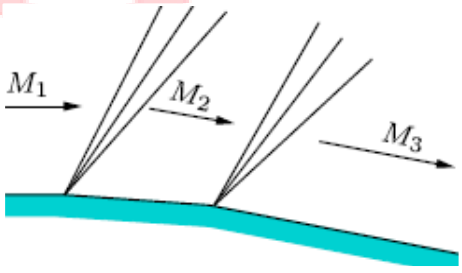
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EXM/P/09/00

Year and Program: TY BTech	**School of Technology**	**Department: Aeronautical Engineering**
Course Code: AET301	**Course Title: Aerodynamics-II**	**Semester : V**
Day : **Date:**	**End Semester Examination**	**Time:2 Hrs.** **Max Marks:50**

Question Paper

Instructions: 1) All questions are compulsory.
2) Assume appropriate values wherever necessary.

		Marks	Bloom's Level	CO
Q.1	**Answer the following (any two)–**			
a)	Explain different flow regimes with diagrams.	8	L_2	CO1
b)	Consider a point in an airflow where the local Mach number, the static pressure and the static temperature are 3.5, 0.3atm and 180K, respectively. Calculate local values of P_0, T_0, T^*, a^* and M^* at this point.	8	L_3	CO2
c)	Consider a normal shock wave in air where the upstream flow properties are u_1 = 680m/s, T_1 = 288K, and P_1 = 1 atm. Calculate the velocity, temperature, and pressure downstream of the shock wave.	8	L_3	CO2
Q.2	**Answer the following (any two) –**			
a)	A Mach 2 uniform air stream at P_1 = 800 kPa and T_1 = 270 Kexpands through two convex corners of 10^0each, as shown in figure 1. Determine the Mach number M_3 of second fan and P_2,$T_2$and the angle of the angle of the second expansion fan.Figure 1 	8	L_4	CO2
b)	Derive an expression for Area-Mach number relation for supersonic flow through nozzle.	8	L_3	CO3
c)	With a neat sketch, explain the working of supersonic wind tunnel.	8	L_3	CO3

Q.3 **Answer the following (any two) –**

a)	Explain supercritical airfoil in detailand compare it with normal airfoil using sketches and plots.	9	L_3	CO4
b)	Write about the critical Mach numberin detail.	9	L_3	CO4
c)	Assume that you are working on the F-104 supersonic fighter design and you need to computeaerodynamic properties at different angles of the attack for the wing. You must use the linearized theory to obtain the desired parameters. Now, using this linearized theory, calculate the lift and wave-drag coefficients for an infinitely thin flat plate in a Mach 2.6 free stream for the following angles of attack: i. $\alpha = 5$ degrees ii. $\alpha = 15$ degrees iii. $\alpha = 30$ degrees	9	L_5	CO5

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