Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2021

Course: Aerodynamics I **Semester: IV**
Program: B.Tech ASE , ASE+AVE **Time 03 hrs.**
Course Code: ASEG2002 **Max. Marks: 100**

SECTION A [5X6] 30 Marks

S. No.		Marks	CO
Q 1	What are the difference between continuum flow and free molecule flow ?	**5**	**CO1**
Q 2	Define a) Ideal and real fluid b) Absolute pressure and Gauge pressure	**5**	**CO1**
Q 3	Define path line, streak line and stream line. At what condition does these lines becomes identical ?	**5**	**CO 2**
Q4	State the application of potential theory for a flow past a stationary cylinder.	**5**	**C03**
Q5	Explain with a neat sketch the formation of starting vortex ?	**5**	**C04**
Q6	Explain the Phenomena of downwash and the induced drag.	**5**	**C05**

SECTION B [10X5] 50 Marks

Q7	Starting from basic principles, deduce the generalized momentum equation in three dimensional flow of any fluid , unsteady, Compressible or incompressible, viscous or inviscid flow.	**10**	**CO2**
Q8	Obtain flow pattern and expressions for stream line and velocity potential for a Rankine oval by superimposing Source , Sink and uniform flow ?	**10**	**C03**
Q9	The velocity vector in a two-dimensional steady flow is given by $V = 2x^3\mathbf{i} - 6x^2y\mathbf{j}$. State whether the flow is irrotational. If irrotational find the velocity potential. If rotational, find the vorticity. Also find the circulation about the circle.	**10**	**CO 3**
Q10	Derive the expression for the velocity induced by infinite vortex filament using the Biot-savart law: Infinite and semi-infinite vortex filament expressions for incompressible flow.	**10**	**C05**
Q11	Derive an expression for lift coefficient and induced drag coefficient in terms of circulation strength Γ(y) for a finite wing .	**10**	**C05**

SECTION C [20X1] 20 Marks

Q 12	Show with a neat sketch the representation of the Vortex sheet. Proof that the local jump in the tangential velocity across the vortex sheet is equal to the local sheet strength and also deduce the Kutta Condition for a finite trailing edge.	**20**	**C04**