

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, July 2020

Course: Aerodynamics I
Program: B.Tech ASE , ASE+AVE
Course Code: ASEG2002

Semester: IV
Time 03 hrs.
Max. Marks: 100

Instructions:

1. Read the Instruction carefully before attempting
2. For Theory based : Type the Answers in word file
3. For Figures if any : Draw a free hand sketch and insert the same word file
4. For Numerical : Solve it in a paper and insert in the same word file
5. Upload as a single word file for all the Question in Blackboard.

Note : Please upload the word document only, Do not upload PDF and or other format. The answer scripts will be considered for evaluation only through Blackboard. No other mode of submission is acceptable.

SECTION A [5X4] 20 Marks

S. No.		Marks	CO
Q 1	Write important difference between Newtonian and Non-Newtonian Fluids with Examples	4	CO1
Q 2	Why it so important to make a distinction between rotational and Irrotational flow ?	4	CO2
Q 3	i. Are pathlines and streamlines same? Justify your answer. ii Are pathline and streaklines identical for steady flow? Justify your answer	4	CO 3
Q4	Explain Lift in an airfoil with respect to Kutta JouKowshi's Thoerem	4	C05

SECTION B [10X4] 40 Marks

Q 5	Apply first law of thermodynamics to finite control volume fixed in space and hence derive the energy equation.	10	CO2
Q6	State the difference between $D\rho/Dt$ and $\partial\rho/\partial t$. Prove that the Instantaneous time rate of change of density of fluid element as it moves through a point is given by $D\rho/Dt$.	10	C01
Q 7	Superimpose uniform flow with a doublet flow of strength "k". Find out following parameters for the resulting flow: i. Stream function and Velocity potential ii. Radial and tangential velocities iii. Location of stagnation points	10	CO 3

NOTE : The submission time of the Question Paper Answer Sheet is 24 Hrs from the scheduled time (exceptional provision due to extraordinary circumstance due to COVID-19 and due to internet connectivity issues in the far-flung areas).

No Submission will be entertained after 24 Hrs

	iv. Equation of streamline passing through stagnation point. By using parameters obtained for the superimposed flow, find out the coefficient of pressure distribution on the surface of circular cylinder		
Q8	Discuss the Aerodynamics Phenomenon involved in formation flying and Ground Effect.	10	CO4
SECTION C [20X2] 40 Marks			
Q 9	Apply thin Airfoil theory to find out the dependence of lift coefficient on angle of attack for a Symmetrical airfoil.	20	C04
Q 10	State Bio-Savart law and derive an expression for the velocity induced by an infinite vortex filament at a point, which is at a distance r from the filament and Derive the fundamental equation of Prandtl's classical lifting line theory.	20	C05

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