INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

AERONAUTICAL ENGINEERING

ASSIGNMENT QUESTIONS

Course Name	:	**ADVANCED COMPUTATIONAL AERODYNAMICS**
Course Code	:	**JNTUH R15 - A72116**
Class	:	**IV B Tech I Semester**
Branch	:	**AERONAUTICAL ENGINEERING**
Year	:	**2018 – 2019**
Course Coordinator	:	**Ms. D. Anitha, Assistant Professor, Dept of AE.**
Course Faculty	:	**Ms. D. Anitha, Assistant Professor, Dept of AE.**

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner‟s learning process.

S No	QUESTION	Blooms Taxonomy Level	Course Outcomes
	ASSIGNMENT-I **UNIT - I** **PANEL METHODS**		
1	Derive the velocity components at different cases for two dimensional constant strength source distributions.	Remember	1
2	Calculate the velocity components at different cases for two dimensional constant strength doublet distributions.	Understand	1
3	Explain the preliminary considerations prior to establishing the numerical solution?	Understand	1
4	Explain the concept of reduction of a problem to a set of linear algebraic equations?	Remember	1
5	Briefly explain about the secondary computation or about aerodynamics loads and how are they calculated?	Understand	1
6	Calculate the velocity components at different cases for two dimensional constant strength vortex distributions.	Remember	1
7	Compare the velocity components at different cases for two dimensional constant strength for vortex distributions and doublet distributions	Understand	1
8	List out the steps in detail for solving the two dimensional doublet distribution of constant strength using Neumann conditions.	Understand	1
9	Compare the velocity components at different cases for two dimensional constant strength for source distributions and doublet distributions	Remember	1
10	Explain about the effects of flow compressibility and viscosity in the computational fluid dynamics.	Understand	1
	UNIT - II **METHOD OF CHARACTERISTICS, BOUNDARY CONDITIONS**		
1	Discuss the concept of input and output boundary and list its differences.	Remember	3
2	List out the differences in injection boundary and periodic boundary.	Understand	2

3	Explain interface between grids and the concept of far-field.	Understand	4
4	Explain various flow gradients at boundaries.	Remember	2
5	Describe about characteristic variables in viscous flows.	Understand	3
6	Explain in brief about the importance of finite element method and its comparison with method of characteristics.	Remember	2
7	Explain in brief about injection boundary and compare it with input/output boundary.	Understand	3
8	Discuss the flow gradients at boundaries of unstructured grids.	Understand	5
9	Explain in brief about Symmetry plane and coordinate cut.	Remember	5
10	Discuss solid wall in viscid flow and compare it with viscous flow.	Understand	4
	UNIT-III **NUMERICAL SOLUTION OF TRANSONIC SMALL DISTURBANCE EQUATION**		
1	Explain briefly about super-critical airfoil with numerical calculations?	Remember	4
2	Discuss the boundary conditions used in upwinding schemes in supersonic flows with numerical calculations?	Remember	6
3	Derive the equation for transonic small disturbance equations.	Understand	7
4	List out the transonic parameters which involved in the small disturbance equations.	Understand	5
5	Briefly explain the Mach number and list the types of flows with respect to Mach number	Understand	7
	ASSIGNMENT-II **UNIT-III** **NUMERICAL SOLUTION OF TRANSONIC SMALL DISTURBANCE EQUATION**		
1	Discuss Murman-Cole upwinding schemes in supersonic flow regions.	Remember	8
2	Compare the physical and theoretical aspects of transonic flows	Remember	7
3	Describe Murman-Cole switching schemes in supersonic flow regions.	Remember	8
4	Explain the finite difference formulation in Transonic small disturbance equation.	Understand	8
5	Compare the numerical solutions between Murman-Cole switching and Murman-Cole unwinding in supersonic flow regimes.	Remember	7
	UNIT-IV **NUMERICAL METHODS FOR EULER EQUATIONS, BOUNDARY LAYER EQUATIONS**		
1	Differentiate between Steger-Warming flux vector splitting method and Van Leer flux vector splitting method	Understand	9
2	Examine the different process in discretization of boundary.	Remember	10
3	Explain Explicit discretization of the boundary and Implicit discretization of the boundary.	Understand	9
4	Discuss the need and requirement for boundary layer transformation.	Understand	9
5	Explain the effect of boundary layer edge and wall shear stress and how it effects the numerical calculations in computational fluid dynamics	Remember	10
6	Discuss the concept of integration of continuity equation with the numerical calculations	Understand	9
7	Solve the implicit difference equations of boundary layer and explicit difference equations of boundary layer	Remember	9
8	Explain the need of boundary layer transformation in boundary layer theory with the simple steps.	Understand	10
9	Mention the approach of Keller- Box scheme with the numerical steps to solve the equation.	Understand	9
10	Explain boundary layer thickness and the importance of boundary layer equations.	Remember	10

UNIT-V TIME DEPENDENT METHODS			
1	Explain in brief the necessity and requirement of time split methods.	Understand	11
2	Explain the necessity and requirement of McCormack method.	Remember	12
3	Discuss approximate factorization schemes.	Understand	11
4	Explain the necessity and importance of approximate factorization.	Understand	11
5	Discuss the description of Lax-Wendroff scheme.	Remember	12
6	Explain McCormack two step Predictor-corrector method.	Understand	11
7	List the difference between corrector method and predictor method.	Remember	12
8	Discuss various time split methods.	Understand	11
9	Differentiate the forward-time forward space method and forward-time central space method	Understand	12
10	List the difference between time split methods and approximate factorization.	Remember	11

Prepared By: Ms. D. Anitha, Assistant Professor.

HOD, AE