

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

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

Course: Grid Generation Techniques
Program: M.Tech CFD
Course Code: ASEG 7023

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

SECTION A

S. No.		Marks	CO
Q1.	Discuss on the significance of discretization.	5	CO1
Q2.	Why transformation of grid from physical plane to computation plane is required?	5	CO1
Q3.	Differentiate structured and unstructured grid. (Only 3 points)	5	CO2
Q4.	“While simulating external aerodynamics phenomenon, sizing must be provided normal to the surface of the body.” Whether the above sentence is true or false. Justify your answer.	5	CO3
Q5.	“Computational time required for simulation of a particular phenomenon using structured grid is higher as compared to unstructured grid.” Whether the above sentence is true or false. Justify your answer.	5	CO3
Q6.	“Partial differential equation techniques can create smoother grid than algebraic grid generation techniques.” Whether the above sentence is true or false. Justify your answer.	5	CO3

SECTION B

Q7.	The velocity (U) of a flow is varying with the distance (x) as per the below relation $U = e^x$ Calculate following at $x = 1$: <ol style="list-style-type: none"> i. Exact value of $\frac{du}{dx}$ ii. Approximate value of $\frac{du}{dx}$ with $\Delta x = 0.1$ using second order central difference. iii. Error percentage. 	10	CO1
Q8	Why is it important to maintain quality parameters of the grid. Explain following quality parameters in brief: <ol style="list-style-type: none"> i. Aspect ratio ii. Skewness 	10	CO2
Q9	Discuss following grid generation methods in brief: <ol style="list-style-type: none"> i. Quadtree method ii. Paving method 	10	CO2
Q10	Emphasis on the methodology of generation of structured grid by elliptical grid generation technique.	10	CO3
Q11	Comment on the accuracy of Delaunay triangulation method for generation of unstructured grid. Compare it with advancing front method.	10	CO4

SECTION-C

Q 12

Discuss in detail about the Lagrange polynomial mapping method for generation of structured grid.
Apply this method to map physical axis to computational axis for the following nodal data:

Nodal Coordinates on physical axis	Corresponding coordinates on computational axis
22	41
51	74
83	108
98	143

OR

Explain how physical stretched structured grid can be mapped to computational equidistance grid using Hermite polynomial method?

Map the following coordinates by applying Hermite polynomial method:

Nodal Coordinates on physical axis	Corresponding coordinates on computational axis
1	1
2	4
3	9

20

CO4