Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Numerical Methods for Multiphase flows **Semester: II**
Program: M.Tech CFD **Time : 03 hrs.**
Course Code: ASEG 7028 **Max. Marks: 100**

Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Explain about Disperse Phase Separated flows in solid-liquid flows modelling.	**4**	**CO1**
Q 2	Explain about Quality, Concentration and Loading in two phase flows	**4**	**CO3**
Q 3	Describe the expressions and significance of Relative (Slip) Velocity and the Drift Velocity.	**4**	**CO 2**
Q 4	Explain about slug and plug flow patterns, how these flows can be identified on flow pattern.	**4**	**CO 2**
Q 5	Explain about open channel flow modeling and significance of upstream boundary conditions.	**4**	**CO 1**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Explain about horizontal flow patterns using effective schematic diagrams, draw flow pattern graph for both the configurations ? Also explain about effect of turbulence on flow resigns?	**10**	**CO3**
Q 7	Explain about Response time and derive the expressions for Thermal response time and momentum response time.	**10**	**CO 2**
Q 8	Explain about phase coupling and derive expressions for Momentum and Mass coupling for various phases?	**10**	**CO 1**
Q 9	Derive Individual phase momentum equation and Continuous phase	**10**	**CO 3**

	momentum equation for two- fluid approach		
SECTION-C (2Qx20M=40 Marks)			
Q 10	Derive the expression for pressure drop in a horizontal pipe where water and gas is injected using homogenous model with no slip condition.	**20**	**CO 4**
Q 11	Consider the Momentum Exchange in Solid–Fluid System Modeling with the Eulerian Multiphase Model. In this work results of spouted bed grain dryer simulation tests where barley grain was the working medium and analyses the influence of the model describing momentum exchange between components of the fluid–solid type mix on the dynamics of the fluidized bed and height of the fountain characteristic for that type of devices. The Eulerian multiphase model (EMM), in which the model describing the interphase momentum exchange was changed, while other conditions were constant, was the base of the simulation. The computations were made using the FLUENT software package and the so-called user-defined functions. Verification of correctness of implementation of those models (for the models for which it was possible); presentation of the object of study (simulation tests were based on earlier made experimental tests); results of simulations for 12 resistance models and two granular viscosity models and considerations on selection of the resistance model in the context of a spouted bed grain dryer. Answer the following questions based on the plots provided below (20 Marks) 1. Explain the experimental setup from the given schematic diagram and create a computation domain from the system and explain the modeling and meshing methods? 2. Explain the variation of grain volume fraction for different models based on the plot given below? 3. Choose one of the best model from the following results and explain the merits and demerits across other models? 4. Explain the Challenges in Fluid Solid Flow modelling in ANSYS Fluent.	**20**	**CO 5**

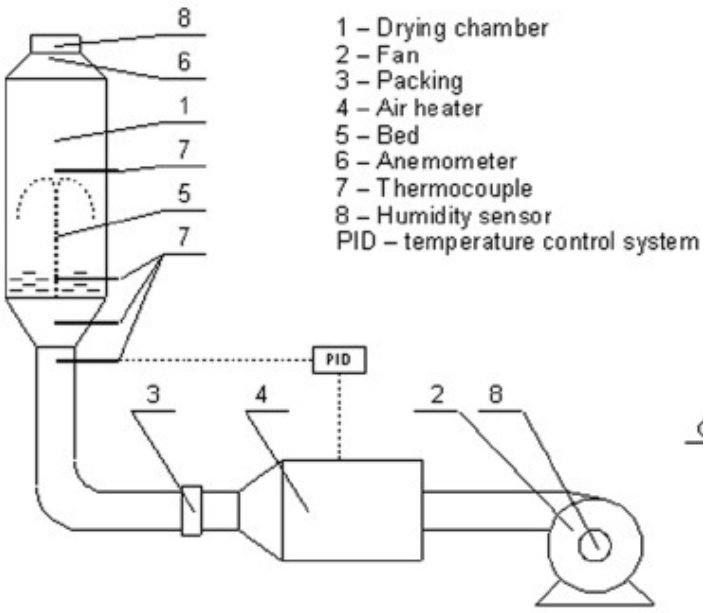

Diagram of the test station

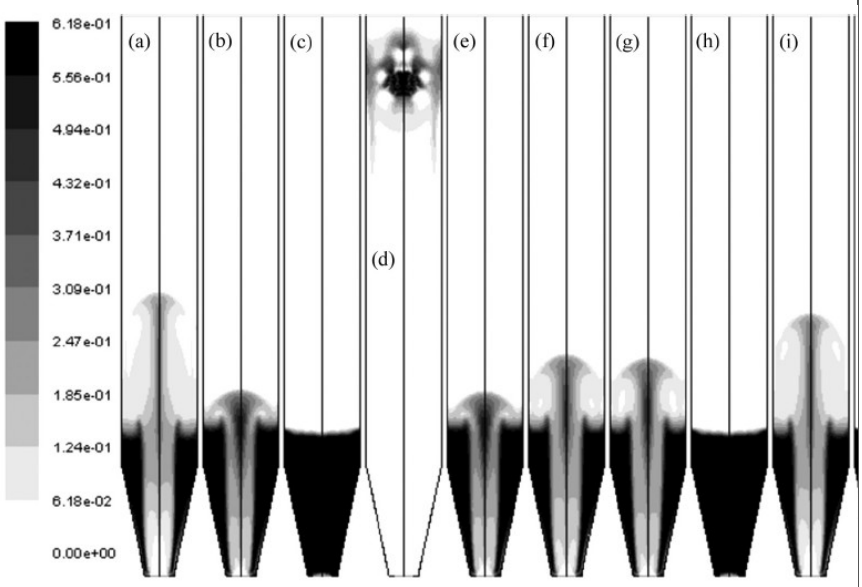

FIG. 3. Distribution of grain volume fraction of Mauritia for models by: (a) Ergun (b) Wen-Yu (c) Nieuwland et al (f) Syamlal-O'Brien (g) Gidaspow (h) Arastoopour et al. (i) Ma-Ahmadi (j) Louge et al. (k) Di Felice (l) Andre viscosity according to Syamlal-O'Brien)

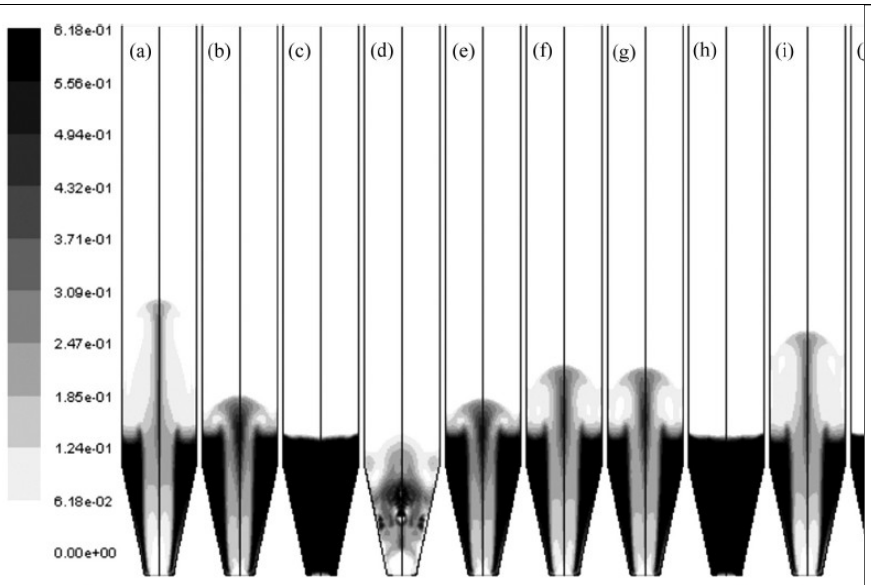

FIG. 4. Distribution of grain volume fraction of Prestige for models by: (a) Ergun (b) Wen-Yu (c) Nieuwland et al. (f) Syamlal-O'Brien (g) Gidaspow (h) Arastoopour et al. (i) Ma-Ahmadi (j) Louge et al. (k) Di Felice (l) Andrew viscosity according to Syamlal-O'Brien)

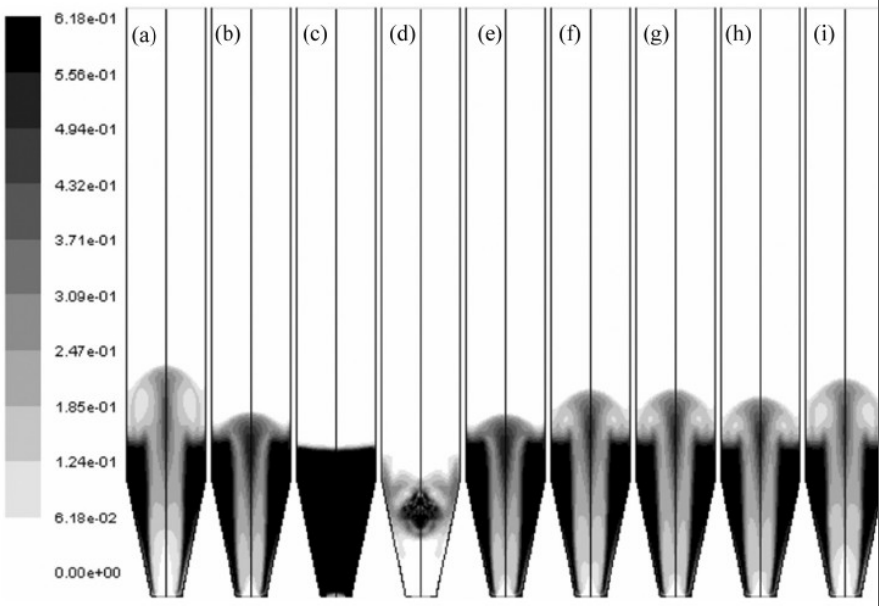

FIG. 5. Distribution of grain volume fraction of Mauritia for 12 selected models (in all cases granular