Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

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

Course: Particle and Fluid Particle Processing
Program: B. Tech (Chemical Engineering)
Course Code: CHCE 3030

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

Instructions:

1. This is a **closed book** examination. Please write your answers with detailed information, wherever required.
2. In case of any missing data or information, make necessary assumptions with proper reason.

SECTION A

S. No.		Marks	CO
Q 1	What is particulate system? Will it be right to call them fluids? State reason (*only one is enough*).	4	**CO1**
Q 2	Out of open and closed circuit crushing, which one do you think is more efficient? State your reason (s).	4	**CO2**
Q 3	What is terminal settling velocity? What is its importance?	4	**CO3**
Q 4	What is pneumatic transport? What is its significance?	4	**CO4**
Q 5	What is nanoparticle? Will it be right to call a single "human hair" as a nanoparticle? State reason (*only one is enough*).	4	**CO5**

SECTION B

Q 6	A powder material of average size of ~0.5 inch needs to be size reduced to about ~5 µm in size. Select suitable size reduction equipment for the purpose with proper reasons. Describe in details about the working of the equipment and its dominant mode of comminution involved. **OR** Explain in detail about the similarities and dissimilarities between a cone crusher and gyratory crusher.	10 10	**CO2**
Q 7	State in detailed about the differences between free settling and hindered settling. Include which of the assumptions are relax during the study of hindered settling.	10	**CO3**
Q 8	How can you transform a fixed bed into a fluidized bed? Elaborate the detailed steps in point wise. **OR** Derive Kozeny-Carman equation and mention all the necessary assumptions and its limitations.	10 10	**CO4**
Q 9	With the help of five (5) examples, elaborate in detail about the role of nanotechnology in the improvement of modern human civilization.	10	**CO5**

SECTION C

Q 10

A slurry consist of x % by weight of solids (specific gravity = 2.5) is to be clarified by continuous sedimentation. The feed to the clarifier is 4000 m^3/day. The underflow contains 15% solids. Design the thickener/clarifier.

Consider the liquid phase of the slurry as water. Here, x = [2 + (Last two digit of your roll number × 0.1)] & h_o = [42 + (Last digit of your roll number)]

The batch sedimentation test data is given as,

time (min)	0	5	12	24	40	70	250	infinity
Height of interface (cm)	h_o	25	15	8	5	3	1.8	1.7

20 **CO4**

Q 11

A particle of square shape having 2.3 mm × 2.3 mm face with a thickness of 1 mm falling in an oil. Compute the terminal settling velocity (V_t).

Given data:

ρ_p = 3500 kg/m^3, ρ_f = 850 kg/m^3,

μ_f = (first two digit of your roll number + 0.13) poise

Acceleration due to gravity, g = 9.8 m s^{-2}

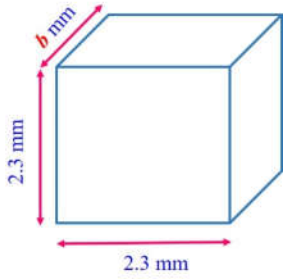

Fig. 1: Dimensions of the particle. Here, the breadth of the particle, ***b*** = (last digit of your roll number +0.1) mm

20 **CO3**

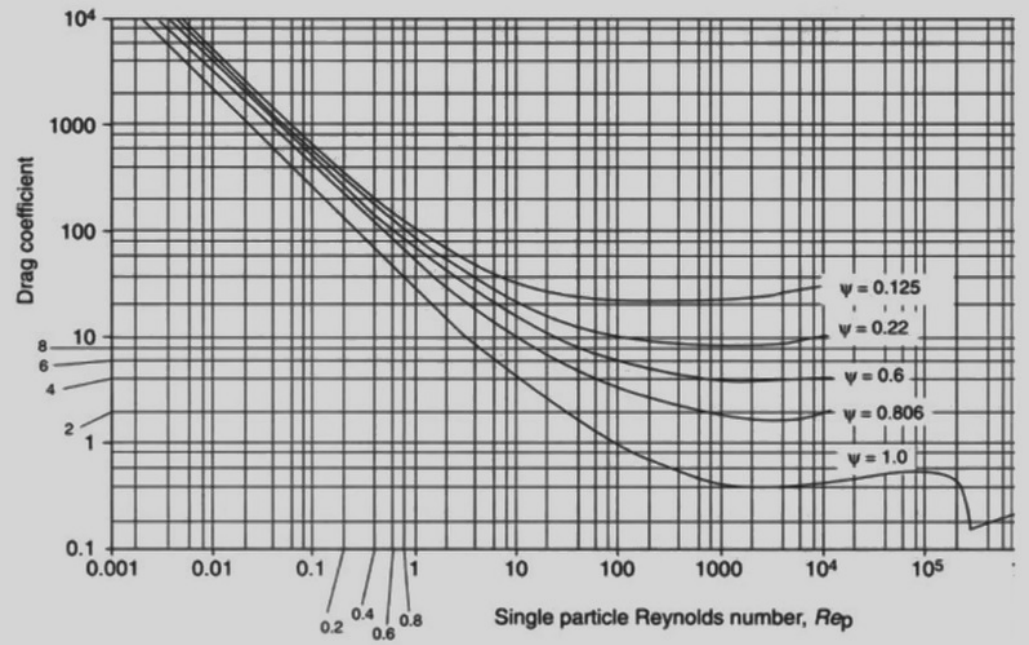

Fig. 2: Drag coefficient curve for various particles of sphericity, ψ.