BEL 302: Fluid Solid Systems

Major Examination

4th May, 2007
15.30 – 17.30 Hours
II LT-2

Answer all questions. Maximum marks 40.

1. Sketch the profile of drag coefficient (C_D) versus particle Reynolds number (NRe_p) for (i) a circular disk with face perpendicular to the direction of fluid flow (ii) a solid cylinder with axis perpendicular to the direction of fluid flow. Will the profile for the cylinder change if it is turned through 90° such that its axis is parallel to the direction of flow? How? Explain the cause for any change you anticipate.

(5 marks)

2. Explain what you understand by 'terminal settling velocity' as applied to a particle falling through a column of liquid. If the particle is a circular disk of diameter 'D' and thickness 't', derive an equation for its terminal settling velocity.

(5 marks)

3. List some applications of fluidization. What do you understand by 'continuous fluidization'? Mention any one application where continuous fluidization is employed.

(5 marks)

4. Briefly describe how scale up of Centrifugation is done.

(3marks)

6. Define filtration. What are the main factors for the selection of equipment and the operating conditions of filtration. Briefly describe two different ways of operating a normal batch filtration process.

(5marks)

7. Describe the different stages in the operation of a Rotary Vacuum filter. Also indicate its advantage over other filtration equipments.

(5marks)

8. Briefly describe the pretreatment methods employed for improving the filtration characteristics of the fermentation broths.

(5marks)

9. Describe Darcy's law of filtration. Describe the conditions of applicability of the above law for biological separations. Describe the procedure to find out the specific cake resistance and filter medium resistance for incompressible cakes.

(5marks)

10. Name different types of equipment which are commonly used for batch filtration indicating the limitations and advantages of each one of them.

(2marks)