## **GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER- VIII • EXAMINATION - SUMMER 2016**

## Subject Code: 183503 **Subject Name: Solid Fluid Operations** Time:10:30 am to 1:00 pm **Instructions:**

Date: 7/5/2016

## **Total Marks: 70**

- - 1. Attempt all questions.
  - 2. Make suitable assumptions wherever necessary.
  - 3. Figures to the right indicate full marks.
- Q.1 Trap rock is crushed in a gayratory crusher. The feed is nearly uniform 2 in 07 (a) spheres. The differential screen analysis of the product is given in column. The power required to crush this material is 400 KW is needed to crush material out of which 10 KW is needed to operate the empty mill. The feed rate is 100 tons/hr. find work index for each mesh size necessary for series of first grinders. (Hint: Use Bond method )

Mesh (inch)	First Grind product analysis (tons)
4/6	20
6/8	30
8/10	30
10/14	20

- 07
- (b) Particulate matters in community waste water are inserting in settling chamber with temperature of 25 degree Celsius. The diameter of average particulate matter is 0.03 mm on an average. The kinematic viscosity of water is 0.90 centi stock. Specific gravity of water is 2.65 inch. Find settling velocity and type of flow in settling chamber.
- The screen analysis of dolomite shown that diameter of particle is 4.66 mm and Q.2 **(a)** 07 volume of particle is 83 mm  $^3$ . The mass of particle is 0.0251 gm and sphericity is 0.571. For material with size range of 4 meshes to 200 meshes calculate total surface weighted area and number of weighted particulate matters. (Density= 2650 kg/m3)

	(b)	Explain different type of settling in sedimentation.	07
		OR	
	<b>(b)</b>	Derive Newton's law for sedimentation	07
Q.3	<b>(a)</b>	Explain Ergun equation with limitations. What is flooding in packed bed?	07
	<b>(b</b> )	How many different fluidization techniques describe by Kunnii & Levenspile?	07
		Elaborate the same.	
		OR	

- What is bubble wake? How it is relate with Devidson's Model of Bubble rise? Q.3 (a) 07 Explain gulf streaming for bubble rise.
  - (b) What is saltation velocity? Explain dense phase and dilute phase conveying. 07
- We can filter 250 cm<sup>3</sup> of a slurry, containing 0.016 g progesterone per cm<sup>3</sup>, in 07 **Q.4 (a)** 32 min. Our filter has a surface area of  $8.3 \text{ cm}^2$ , a pressure drop of 1 atm, and a filter medium of negligible resistance. The solids in the cake have a density of  $1.09 \text{ g/cm}^3$ , and the slurry density is that of water.

We want to use this experiment to estimate the time to filter 1,600 liters

of this slurry through a centrifugal filter. The filter has a basket of 51 cm radius and 45 cm height. It rotates at 530 rpm. When it is spinning, the liquid and cake together are 5.5 cm thick. How long will this filtration take?

(b) Derive hydrostatic equilibrium in centrifugal filtration by help of Darcy's 07 Equation.

## OR

Q.4	<b>(a)</b>	Derive equation of cake filtration.	07
-	<b>(b)</b>	Write a short note on vacuum drum filter.	07
Q.5	<b>(a)</b>	Enlist principals of agglomeration and explain any one in detail.	07
-	<b>(b)</b>	Enlist and explain the limitations of hopper in particulate flow?	07
		OR	
Q.5	<b>(a)</b>	What is extrusion? Give one example of extrusion.	07

(b) Explain mechanism of flow of solid particles in silos. 07

\*\*\*\*