2007 ANDHRA UNIVERSITY

II YEAR B.E/B.TECH DEGREE EXAMINATIONS

MECHANICAL OPERATIONS

(CHEMICAL ENGINEERING)

TIME: 3 HOUR
MARK: 70

- Question 1 Is Compulsory
- Answer Any Four From Questions 2 To 8
- All Questions Carry Equal Marks

.

1. a) What do you understand by sphericity of a particle?

b) Toothed roll crusher is not used for size reduction of hard solids - why?

c) Differentiate between agitation and mixing.

d) Define drag and drag coefficient.

e) What are filter aids? Give an example.

2. a) State and explain the three laws of crushing

b) A set of crushing rolls of 100 cm. diameter by 50 cm breadth. The gap between the rolls is 1.25 cm and they are being run at a speed of 100 rpm. If the angle of nip is 290, calculate the maximum size of speed and actual capacity in tons per hour if the rolls operate at 12% of the theoretical capacity. Take sp. gr. of the feed as 2.35.

3. a) Capacity and effectiveness of screens are two opposite factors - Explain.

b) Calculate the effectiveness of 14 mesh screen from the following data:

11 Mesh Mass % retained Feed Overflow underflow

6 2.5 7.1 -

8 12.5 35.9 -

10 32.1 42.1 20.0

14 25.7 12.0 38.0

20 15.9 3.0 25.0

28 7.4 - 14.0

35 3.9 - 3.0

100 100 100

4. a) With a neat sketch explain the working of a rotary drum filter.

b) A rotary filter of filtering area 0.7m2 has been found to deliver 250 liters of filtrate per minute operating with a speed of 2 rpm. Another filter is to be designed to handle the same slurry with a delivery of 2.5 m3 of filtrate per minute operating with a speed of 1.5 rpm. Estimate the filtering area of the filter assuming all the other factors to be the same.

5. a) Derive an expression for the terminal velocity of a spherical particle settling in Stoke's law region.

b) Estimate the settling velocity of the drops of oil (sp. gr. 0.90) of 15 microns in diameter settling through air at 1 atm. pressure and at 200C. Assume viscosity of air = 0.018 cP and settling is in Stoke's law region. 12

6. Suggest suitable conveyors for the following situations and explain their working.

i) Transportation of lumps of ore over long distances of the order of 1 km.

ii) Transportation of an irritating material like soda ash.

7. Explain the froth flotation technique for separating two components in a mixture.

8. Write short notes on any three of the following.

a) Trommels.

b) Dorr thickener.

c) Open and closed circuit grinding.

d) Sink and float method of separation.

e) Magnetic separator.