Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – WINTER 2013

Subject Code: 150502 Date: 29-11-2013

Subject Name: Mechanical Operation

Time: 10.30 am - 01.00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain differential and cumulative method of particle size analysis. **04**

(b) Calculate the spherecity of a cube of width 1 cm. **04**

(c) Define Rittingers law and Work Index. **04**

(d) Define an ideal screen. **02**

Q.2 **(a)** With the help of a neat sketch explain the construction and working of a roller crusher and write the important equations for roll crusher. **07**

(b) Explain size reduction process with reference to the methods of comminution, ideal equipment and ideal product characteristics. **07**

OR

(b) Describe the working of a ball mill and derive the expression for critical speed of a ball mill. **07**

Q.3 **(a)** Describe different types of conveyers in brief used for solid transport. **07**

(b) A silty soil containing 14% moisture was mixed in a large Muller mixer with 10.0 weight percent of a tracer consisting of dextrose and picric acid. After 3 minutes of mixing, 12 random samples were taken from the mix and analyzed calorimetrically for tracer materials. The measured concentrations in the samples were, in weight percent tracer, 10.24, 9.30, 7.94,10.24, 11.08, 10.03, 11.91, 9.72, 9.20, 10.76, 10.97 and 10.55. Calculate the mixing index. **07**

OR

Q.3 **(a)** Discuss the principles of solid mixing and explain the working of the Muller mixer in details. **07**

(b) One ton per hour of limestone is produced by crushing and then screening through a 14 mesh screen. According to the screen analysis (in weight percent) given below, calculate: (i) the total load to the crusher, (ii) the effectiveness of the screen. **07**

Screen analysis:

Mesh	Feed %	Undersize %	Oversize %
4 on	14.3	-	20
8 on	20.0	-	28
14 on	20.0	0	28
28 on	28.5	40	24
48 on	8.6	30	0
100 on	5.7	20	0
100 through	2.9	10	0
Total	100	100	100

Q.4 **(a)** Describe fluidization regimes with neat sketch. **07**

(b) Explain filtration principles and explain the working of a plate & frame filter press. **07**

OR

Q.4 **(a)** Discuss Geldarts classification of powders. **07**

(b) In a filter press, at a constant pressure difference of 2.8 kg/cm^2, a 10cm cake is formed in one hour with a filtrate volume of 6000 lits. Washing proceeds exactly as filtration using 1500 liter. All other operation takes 10 mins time. Assume the filtrate has same properties of wash water. The rate of washing is 0.25 times the final filtration rate. Calculate the volume of filtrate produced in one day of operation. **07**

Q.5 **(a)** (i) Define mixing and agitation and their importance. **08**
(ii) Define Power number and Reynolds number and their relation in liquid mixing.

(b) Describe the working principle of a cyclone separator and show the different types. **06**

OR

Q.5 **(a)** Discuss the principle of gravity settling process and explain any one related equipment in detail. **07**

(b) Explain different types of impellers along with a neat sketch. **07**

****