Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. Sem. - V - Examination – June- 2011

Subject code: 150502
Subject Name: Mechanical Operation

Date:22/06/2011 **Time: 10:30 am – 01:00 pm**
Total Marks: 70

Instructions:

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

Q1]

a) Define: **[10]**
(i) mixing index (ii) spherecity (iii) work index
(iv) Differential & Cumulative analysis (v) Tyler standard sieve series.

b) Differentiate between open circuit and closed circuit grinding operation. **[04]**

Q2]

a) Explain working of a smooth roll crusher. Define angle of nip. **[07]**

OR

a) Derive the expression for critical radius of a ball mill. **[07]**

b) A Blake jaw crusher is used for crushing limestone such that the average size of the particles is reduced from 50mm to 10 mm with energy consumption of 50 W-hr/metric ton. Calculate the energy consumption for crushing the same material from average size of 75mm to 20mm. Use Rittingers law, Kicks law and Bond law. **[07]**

Q3]

a) Discuss principles of cake filtration. Differentiate between constant pressure and constant rate filtration. **[07]**

b) Explain principles of froth floatation with the detail description of a froth floata equipment. **[07]**

OR

Q3]

a) Discuss construction and working of a plate and frame filter press with a neat sketch. **[07]**

b) A sludge is filtered in a washing plate and frame filter press at a constant pressure of 3 kg/cm^2. A 15cm cake is formed in 1 hour with filtrate volume of 6 m^3. At the end of filtration 1.5 m^3 of washing liquor is passed. All other operation takes approximately 10 minutes. Neglect resistance of cloth and flow lines. Determine: **[07]**
(i) the washing time, (ii) amount of filtrate produced in 24 hours.

Q4]

a) Derive the equation for screen effectiveness. List out the assumptions **[07]**

b) A set of crushing roll used to crush rock has rolls of 150 cm diameter by 50 cm width of face and rolling at 100 rpm. They are set so that the crushing surfaces are 1.25 cm apart at the narrowest point. The angle of nip is 30^0. What is the maximum permissible size of the feed? Also calculate the theoretical capacity of the crusher. Sp. Gr of rock = 2.4. **[07]**

OR

Q4]

a) Explain fluidization process and differentiate between particulate fluidization and bubbling fluidization **[07]**

b) One tonne per hour of dolomite is produced by a ball mill operating in a closed circuit with a 100 mesh screen. The screen analysis (wt%) is given below. Calculate the screen efficiency. **[07]**

Mesh	Feed	Oversize	Undersize
35	7.07	13.67	0
48	16.60	32.09	0
65	14.02	27.12	0
100	11.82	20.70	2.32
150	9.07	4.35	14.32
200	7.62	2.07	13.34
-200	33.80	0	70.02
Σ	100	100	100

Q5]

a) Explain the different parts of an agitated vessel with the help of a neat sketch. **[07]**

b) Discuss mixers for pastes and plastic masses. **[07]**

OR

Q5]

a) Discuss the construction and working of a cyclone separator and its types. **[07]**

b) Write a note on different types of impellers and prevention of swirling. **[07]**

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