

**III B.Tech I Semester Supplementary Examinations, November 2006**  
**MECHANICAL UNIT OPERATIONS**  
**(Chemical Engineering)**

**Time: 3 hours****Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) For flow of solids out of a bin which opening is preferable, side opening or a bottom opening? Why? [6]  
(b) What are the factors on which the rate of flow of granular solids by gravity, through a circular opening in the bottom of a bin, depends upon? [5]  
(c) Discuss about various devices for transportation of solids. [6]
2. (a) Describe batch and continuous mixer extruders for hard-to-mix materials. [10]  
(b) Write the significance of mixing rolls for mixing rubber products. [6]
3. (a) What is Kick's law? State its range of application. [4]  
(b) A rock feed having an average particle diameter of 0.025 m is fed to a crusher at the rate of 20 tonnes /hour. The average diameter of product is found to be 0.018 m. At the above condition the mill takes 6.7 kW of power and 0.34 kW power when it is empty.
  - i. Calculate power consumption of the mill if the average particle diameter of product is 0.008m.
  - ii. How much power would be required under condition  
A. by Kick's law?
  - iii. Which of the above results is more accurate? [12]
4. (a) Explain how gas cleaning is carried out using Dust-settling chamber. [8]  
(b) Discuss the working of cross flow wet-settling classifier with a neat diagram. [8]
5. (a) Why does concentration polarization occur in membrane separation processes and how to reduce the concentration polarization effect? [8]  
(b) Discuss about the effect of pressure drop and partial rejection of solutes in membrane separation processes. [8]
6. (a) Derive an expression for calculating the minimum thickener area required for a gravity thickener. [8]  
(b) Quartz particles (density = 2650 kg/m<sup>3</sup>) are settling in water at room temperature. What will be the maximum particle diameter so that stoke's formula can hold good in this case?  
Viscosity =  $1004 \times 10^{-6}$  kg/m.s [8]

7. A flat-blade turbine with six blades is installed centrally in a vertical tank. The tank is 1.5 m in diameter; the turbine is 0.5 m in diameter and is positioned 0.5 from the bottom of the tank. The turbine blades are 125 mm wide. The tank is filled to a depth of 1.5 m with rubber-latex compound at 65°C having a viscosity of 1200 P and a density of 1129 kg/m<sup>3</sup>. The turbine is operated at 95 rpm. The tank is unbaffled. What power will be required to operate the mixer (Make suitable assumptions)? [16]
8. (a) Explain where equilibrium in crystallization process is reached? [8]  
(b) Describe about the yield of crystallization. [8]

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