3rd Semester Back Examination 2019-20
MECHANICAL OPERATION
BRANCH : CHEM
Max Marks : 100
Time : 3 Hours
Q.CODE : HB524
Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1   **Only Short Answer Type Questions (Answer All-10)**   **(2 x 10)**
   a)   Differentiate between ideal screen and actual screen.
   b)   Define screen efficiency and effectiveness.
   c)   What is the effect of cyclone diameter on separation efficiency?
   d)   Define: "Terminal Settling Velocity"
   e)   What is the difference between a clarifier and classifier?
   f)   Define the angle of nip and work index.
   g)   Differentiate between solid and liquid mixing
   h)   What is the use is of filter aid and filter media?
   i)   What is power number and its significance?
   j)   Size reduction equipments, the maximum feed size can be accepted by which crusher?

Part- II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 x 8)**
   a)   Define (i) mesh and (ii) crushing efficiency
   b)   Define critical speed of the ball mill. Explain in detail the construction and working of the Ball mill with neat figure and the industrial application.
   c)   Perform a material balance over a screen and derive the effectiveness of a screen.
   d)   Explain the factors affecting the rate of filtration.
   e)   With a neat sketch explain the working principle of a pneumatic conveyor.
   f)   Discuss various types of screening equipments.
   g)   Write principle of comminution. Explain various laws of size reduction in detail.
   h)   Explain and differentiate open and closed circuit operation for size reduction of solid with neat schematic diagram.
   i)   Explain in detail plate and frame filter press with its neat diagram and advantages.
   j)   What is the differential settling method? Explain in detail the working of batch sedimentation with application.
   k)   Describe the different mixing equipments used for solid mixing in brief.
   l)   Write a short note on rotary filters with neat diagram.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)
Q3 **a)** Define: (i) angle of nip and (ii) mixing index.(iii) angle of repose   **(8)**
   b) In a ball mill of diameter 2000 mm, 100 mm dia. steel balls are being used for grinding. Presently, for the material being ground, the mill is run at 15 rpm. At what speed will the mill have to be run if the 100 mm balls are replaced by 50 mm balls, all the other conditions remaining the same?   **(8)**

Q4 **a)** Draw neat sketch of an agitated vessel and label the important parts. **(8)**

b) An agitated baffle vessel is being used to prepare a uniform solution of viscosity 2 cP, **(8)** running the agitator at 100 rpm, so as to obtain a Reynolds number of 50,000. If the contents of the vessel are replaced by a solution of viscosity 4 cP, and the agitator rpm is increased to 200, by how much will the power requirement change?

Q5 **a)** Describe the different mixing equipments used for solid mixing in brief. **(8)**

b) In a filter press, at a constant pressure difference of 2.8 kg/cm², a 10cm cake is formed **(8)** 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.

Q6 **a)** Explain in brief: Sink and float method of sorting classifiers. **(8)**

b) Calculate the power required to crush 120 tones/hr of limestone if 80 % of the feed **(8)** passes through a screen 3.74 cm aperture and 80 % of the product passes through a screen with 0.04 cm aperture. The work index for lime stone is 12.75, when the capacity is expressed in tones/min, power required in HP and size of feed and product in feet.