

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE (BITS) –PILANI
Hyderabad Campus
First Semester 2022-2023
CHE F313 SEPERATION PROCESSES II

4th November 2022
Weightage :25%

MIDSEM EXAM(Closed Book)

Duration :90 minutes
Max. Marks: 50

Note: All questions need to be answered
 Assumptions any made should be clearly written
 All the steps necessary to derive or solve a problem should be clearly mentioned

1. (a) Define the following terms
 (i) mass mean diameter (ii) effectiveness of a screen (iii) size aggregation or enlargement
 (iv) Crushing efficiency (v) Concentration polarization in membranes **(5M)**
 (b) Define angle of repose and angle of internal friction. Explain the physical significance of these parameters along with differences between them. **(4M)**
 (c) Calculate the sphericity of a cylinder of diameter 1 cm and height 3 cm. **(2M)**

2. (a) Derive a relation to find the critical speed in ball mill along with diagram for the derivation. **(4M)**
 (b) A Crushing roll mill has to crush a feed which is spherical in size with diameter of 40mm to diameter of 10 mm if the coefficient of friction which is tan of half of angle of nip is 0.27. Calculate diameter of the rolls to be used. **(5M)**

3. (a) Derive the relation to find volumetric flow rate in centrifugal filtration along with neat diagram. **(7M)**
 (b) The following data belong to a filtration test conducted under a constant rate of $0.06 \text{ m}^3 \text{ h}^{-1}$. The filtration area is 0.05 m^2 and the solid concentration in the slurry is 30 kg/m^3 . From these data, deduce the values of R_m , α_o , Kr and s . The viscosity of the filtrate is 0.001 kg/m-s **(9M)**

Δp kPa	30	34.1	43.6	52.1	59.3	69.5	80.5	92	103.6
t s	10	20	30	40	50	60	70	80	90

4. (a) Define mixing index. What is information you get from mixing index explain with an example in each case. **(5M)**
 (b) if the additives are to be mixed in rubber what is the mixer that will be used? What is the mechanism which allows the mixing to happen. **(3M)**
 (c) What are the different techniques which can be used to prepare membranes. Explain in brief how the membrane is made in each case. **(6M)**

The equation for pressure drop across packed bed with notation as used in reference text book

$$\frac{dP}{dL} = \frac{150\mu u(1-\epsilon)^2}{(\phi_s D_p)^2 \epsilon^3}$$