GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester Regular) Examinations, May – 2024

22BCHPC24003 – Mechanical Operations

(Chemical)

Time: 3 hrs Maximum: 70 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions

		CO #	Blooms Level
a.	Express the ways to represent the size of an irregular particle.	CO2	K2
b.	Calculate the Volume-surface mean diameter from the data	CO2	K1

Mesh No	4	5	6	8	10
Mesh Opening(mm)	4.75	3.35	2.80	2.00	1.80
Mass Fraction	-	0.15	0.45	0.30	0.10

c.	What rotational speed would you recommend for a ball mill 1200mm in diameter charged with 75mm balls?	CO1	K2
d.	Differentiate between open circuit and closed circuit grinding with neat sketches.	CO3	K1
e.	Why in some cases filter aid is added to the slurry before filtration. Analyse the different methods of applying the filter Aid.	CO3	K1

PART – B **(15 x 4=60 Marks)**

Answer ***ALL*** questions

		Marks	CO #	Blooms Level
2. a.	Outlines the various size reduction machines according to its stages. Name four common ways of breaking solids in size reduction machines. With neat sketches emphasise one Primary Crusher construction, mechanism in detail.	8	CO1	K2
b.	Examine angle of nip by mentioning the different forces applied on Roll faces? Derive an expression for angle of nip for Roll Crusher having same diameter. Mention the capacity of Roll Crusher.	7	CO3	K1
	(OR)			
c.	Express the Ball mill principle for primary grinding. Discuss in detail about the various factor by which grinding efficiency can be increased.	7	CO1	K2
d.	Calculate the Operating speed of the Ball Mill form the following data i) Diameter of Ball Mill : 500 mm ii) Diameter of Ball : 40 mm iii) Operating speed is 50% of the critical speed of the Mill.	8	CO3	K2
3.a.	Appraise the screening mechanism with respect to oversize and undersize? Discuss the importance of separation based on particle size. Mention the factors affecting the Screening operations.	8	CO1	K3
b.	A sand mixture was screened through a standard 12 mesh screen. The mass fraction of the oversize in the feed, overflow and underflow were found to be 0.4,0.8 and 0.2.Calculate the screen effectiveness based on the Oversize materials.	7	CO3	K2

(OR)

c.	Does the overall material balance over an ideal screen in order to get the expression for Screen Efficiency?	7	CO1	K2
d.	Discuss in detail about Magnetic separation methods and Equipment.	8	CO3	K2
4.a.	Differentiate between thickening and clarification? Mention the Sedimentation Test which can be conducted in Laboratory to get the different zone when solid is subjected in fluid.	7	CO1	K1
b.	Define drag Coefficient .Derive the Stokes's law and Newton's Law for calculating the terminal settling velocity of a particle settling through fluid by assuming all specific assumption.	8	CO3	K2

(OR)

c.	An iron industry uses a screen of 5 mm aperture size to separate the undersize from mixture which is coming from a furnace. The Screen analysis of furnace output founds to contain 25% fines. The efficiency of Screen is 50%. The underflow from the screen contains 95% fines. If the furnace output rate is 100 tons/hour, find the product rate and amount of fines present in it.	8	CO1	K3
d.	Differentiate among Ideal screen and Actual Screen. Mention the Cut point with reference to separation of solids. Draw the graphical presentation of cut diameter in case of Actual screen and Ideal Screen.	7	CO3	K3
5.a.	Differentiate among constant rate and constant Pressure Filtration. Enlist the different resistance offered by which filtration is getting effected.	8	CO1	K2
b.	Summarize the rate equations for Constant Pressure Filtration.	7	CO3	K2

(OR)

c.	State the method of avoiding vortex in agitated vessel. State the different types of mixer used in process Industries.	8	CO1	K2
d.	How the performance of an industrial mixer is judged?	7	CO3	K2

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