U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

April 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Chemical Engineering **Duration: 3 hrs.**
Course Code: 19CH3DCMOP **Max Marks: 100**
Course: Mechanical Operations

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as

			CO	PO	Marks
		UNIT - I			
1	a)	Differentiate between Ideal and Actual Screens. Obtain an expression for the overall screen effectiveness.	CO1	PO1	8
	b)	**Evaluate** the surface-volume mean diameter for the following size distribution by cumulative analysis.	CO2	PO2	8
	c)	Highlight the salient features of Standard screens	CO1	PO1	4
		UNIT - II			
2	a)	Quartz is crushed using a Jaw crusher. Energy consumed by this crusher for no load condition is 0.5 kwh and the capacity is 1 ton per hour. If a feed of 10cm is crushed to lcm the energy consumed is 2.5 kwh. The same crusher is used to crush the same material from an initial size of 50cm to final size of 5cm. compare energy consumption under identical conditions using two different laws.	CO2	PO2	8
	b)	Deduce an equation for angle of nip for a ball mill	CO2	PO2	6

Mesh no	Size range mm	Mass fraction
-	4.699	--
4/6	3.327	0.031
6/8	2.362	0.103
8/10	1.651	0.2
10/14	1.168	0.186
14/20	0.833	0.152
20/28	0.589	0.12
28/35	0.417	0.095
35/48	0.295	0.065
48/65	0.208	0.043
65/-	0.208	0.005

		c)	Explain the working of the ball mill with its construction and figure	***CO2***	***PO2***	**6**
			UNIT - III			
	3	a)	Develop *Kozeny Carman* equation for filtration	***CO3***	***PO3***	**10**
		b)	How important are the filter aids? Explain the working of plate and frame filter press.	***CO3***	***PO3***	**10**
			OR			
	4	a)	Slurry is filtered in a filter of cross-sectional area 20 m^2. The slurry consists of particles of density 2.26 gm/cc. The filter cake has a porosity of 32%. For constant pressure filtration at 3 kg_f/cm^2. i. What volume of slurry is required to build up a cake of 12.5 mm thick? ii. How long will it take to form the cake if the cloth resistance can be neglected? Data: Filtrate viscosity =1.6 cP filtrate density =1.05 gm/cc, solid concentration in the slurry = 4.8% by weight, Specific cake resistance =$1.14x10^{11}$ m/Kg.	***CO3***	***PO3***	**12**
		b)	Differentiate between types of filtration and explain the working of leaf filters with applications	***CO3***	***PO3***	**8**
			UNIT - IV			
	5	a)	Apply the principle of batch sedimentation test and design a continuous thickener.	***CO4***	***PO4***	**14**
		b)	Explain the salient features of cyclone separator with its types.	***CO4***	***PO4***	**06**
			OR			
	6	a)	Calculate the minimum cross-sectional area of a continuous thickener required to handle 50 tons/h of dry solids to produce a thickened sludge of 530 kg solids per m^3 of water. The initial concentration of slurry is 240 kg/ m^3 of slurry. The following data of settling velocity versus solid concentration was obtained in a batch settling test. V, m/hr: 0.1	0.08	0.06	0.03	0.02	0.0 C_L, kg/ m^3: 265	285	325	415	465		***CO4***	***PO4***	**12**
		b)	Derive an equation for terminal settling velocity.	***CO4***	***PO4***	**08**
			UNIT - V			
	7	a)	Elucidate the construction and working of solid mixer.	***CO2***	***PO2***	**8**
		b)	With different mixing impeller arrangements explain their applications	***CO2***	***PO2***	**12**

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