

University of Mumbai

Program: SE Chemical Engineering

Curriculum Scheme: Rev 2019

Examination: Summer 2022

Course Code: 40324 and Course Name: Solid Fluid Mechanical Operations (SFMO)

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	To get a fine talc powder from its granules, the equipment used is
Option A:	Roller crusher
Option B:	Ball mill
Option C:	Jaw crusher
Option D:	Gyratory crusher
2.	With increase in the capacity of screens, the screen effectiveness
Option A:	Remains unchanged
Option B:	Increases
Option C:	Decreases
Option D:	Decreases exponentially
3.	Fluidization occurs when: Drag force by the upward moving gas
Option A:	Weight of the particles
Option B:	Weight of the fluid
Option C:	Volume of the bed
Option D:	Pressure drop across the bed
4.	What is the critical rotational speed, in revolutions per second, for a ball mill of 1.2 in diameter charged with 70 mm diameter balls.
Option A:	1.0
Option B:	0.5
Option C:	0.66
Option D:	2.76
5.	In froth floatation, chemical agent added to cause air adherence is called
Option A:	collector
Option B:	frother
Option C:	modifier
Option D:	activator
6.	Mixing of plastic solids is generally facilitated by
Option A:	dispersion
Option B:	mastication
Option C:	kneading
Option D:	Diffusion
7.	For raschig rings, the sphericity is
Option A:	0.5
Option B:	1

Option C:	<1
Option D:	3
8.	The most suitable equipment for the transportation of 200 mesh size particles is a
Option A:	bucket elevator
Option B:	pneumatic conveyor
Option C:	screw conveyor
Option D:	belt conveyor
9.	The most suitable equipment for removing the fine dust particle (< 1 micron dia.) from air below its dew point will be a/an
Option A:	bag filter
Option B:	electrostatic precipitator
Option C:	cyclone separator
Option D:	wet scrubber
10.	For laminar flow of filtrate through the cake deposited on septum, which of the following will be valid?
Option A:	Kozeny-Carman equation
Option B:	Leva's equation
Option C:	Blake-Plummer equation
Option D:	Jansen equation

Q2. (20 Marks)		
A	Solve any Two	5 marks each
i.	What is Sphericity?	
ii.	Write any two laws for Crushing .	
iii.	Explain Capacity and Effectiveness of Screen.	
B	Solve any One	10 marks each
i.	Derive the expression for critical speed of ball mill	
ii.	Derive constant pressure filtration	

Q3. (20 Marks)		
A	Solve any Two	5 marks each
i.	Write short notes on Packing in Packed bed	
ii.	Explain Types of fluidization	
iii.	Explain with the neat sketch the working principle Screw Conveyors.	
B	Solve any One	10 marks each
i.	Explain Kynch theory of sedimentation in detail with assumptions.	
ii.	A slurry containing 5 kg of water/ kg of solid is to be thickened to a sludge containing 1.5 kg of water/ kg of solids in a continuous operation. A laboratory test using five different concentrations of slurry yielded the following results: Calculate the minimum area of the thickener to effect the separation of 1.33 kg/s of solids.	

Conc. (Kg water/ kg of solid)	5.0	4.2	3.7	3.1	2.5
Rate of Sedimentation, (mm/sec)	0.20	0.12	0.094	0.070	0.052

Q4. (20 Marks)	
A	Solve any Two 5 marks each
i.	Write short note on Electrostatic precipitator.
ii.	Explain in details Muller Mixer
iii.	Write short note on Fabric Filter
B	Solve any One 10 marks each
i.	A plate and frame press, filtering a slurry, gave a total of 8 m ³ of filtrate in 1800 seconds and 11 m ³ in 3600 seconds, when filtration was stopped. Estimate the washing time in seconds if 3 m ³ of wash water was used. The resistance of the cloth can be neglected and a constant pressure is used throughout.
ii.	Derivation for smallest particle separation in cyclone separator