P P SAVANI UNIVERSITY

Third Semester of B. Tech. Examination

December 2022

SECH2020 Mechanical Operation

30.11.2022, Wednesday **Time: 10:00 a.m. To 12:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1	MCQ/Short Question/Fill in the Blanks (Any Five)	**[05]**	**CO**	**BTL**
(i)	What is the mechanism of nut crusher? a) Impact b) Compression c) Shear d) Tear		2	2
(ii)	Which of the following is a size reduction unit operation in liquids? a) Milling b) Mixing c) Grinding d) Homogenization		2	2
(iii)	What are the factors affecting size reduction? a) Shape and size b) Temperature c) Pressure d) Viscosity		2	2
(iv)	What is Bond's law? a) Work required is directly proportional to the surface to volume ratio b) Work required is indirectly proportional to the surface to volume ratio c) Energy required is directly proportional to the surface to volume ratio d) Energy required is directly proportional to the surface to volume ratio		2	2
(v)	Are size reduction results in loss of volatiles in heat sensitive foods? a) True b) False		2	2
(vi)	What is the working principle of ball mill? a) Impact and attrition b) Compression and attrition c) Shear and compression d) Tear and impact		2	2
(vii)	Which of the following machine is not used for fine grinding? a) Jaw crushers b) Ball mill c) Hammer mill d) Attrition mill		2	2
Q - 2 (a)	Explain size reduction Principal also explain any two crushing law	**[05]**	2	1,3
Q - 2 (b)	Explain Principal, Construction and Working of Jaw Crusher.	**[05]**	2	3
	OR			
Q - 2 (a)	Explain Construction and Working of Trommel Screen	**[05]**	1	3
Q - 2 (b)	Discuss five parameters affecting efficiency of screening.	**[05]**	1	3
Q - 3 (a)	Explain in Details Mesh Number	**[05]**	1	1
Q - 3 (b)	Define Bulk Density, Angle of Repose. Angle of nip.	**[05]**	1	1
	OR			
Q - 3	A material is crushed in a jaw crusher and the average size of the particle is reduced from 5 cm to 1.3 cm with consumption of energy at the rate of 37 Watt.hr/ton. What will be the consumption of energy necessary to crush the same material of average size 8 cm to an average size 3 cm? The mechanical efficiency remains same. (a) Using Rittinger's law; (b) using Kick's law.	**[10]**	2	4
Q - 4	Attempt any one/two.	**[05]**		

(i)	Explain the construction and working of bucket elevator & belt conveyor with neat sketch		3	3

SECTION – II

Q - 1	MCQ/Short Question/Fill in the Blanks (Any Five)	[05]		
(i)	How can swirling be prevented in agitated vessels? a) By reducing the power provided b) By the use of turbines c) By the use of Baffles d) By lowering the shaft		4	2
(ii)	What type of mixture is separated by filtration? a) Solid-liquid mixture b) Liquid -liquid mixture c) Solid-solid mixture d) Solid- gas mixture		5	2
(iii)	What is the law behind filtration? a) Darcy's law b) Henry's law c) Dalton's law d) Newton's law		5	2
(iv)	What controls the filtration medium resistance? a) Pressure drop alone b) Flow rate alone c) Both pressure drop and flow rate d) Cake thickness		5	2
(v)	What is filtration medium resistance? a) Resistance by cake b) Resistance by filter medium c) Resistance by solution d) Resistance by cake and filter medium		5	2
(vi)	What is the primary method of filtration? a) Straining b) Sedimentation c) Centrifuge d) Diffusion		5	2
(vii)	What is the advantage of vacuum filtration? a) Efficiency b) Faster than other filtration equipment c) Cost effective d) Low power cost		5	2
Q - 2 (a)	Give significance of Power number, Reynolds number and Froude number for mixing of liquids	[05]	3	3
Q - 2 (b)	Describe different types of solid mixers in brief and their applications	[05]	3	3
	OR			
Q - 2 (a)	How vortex formation can be prevented in agitated vessel. Also Enlist different types of flow pattern induced in an Agitated vessel contains liquid	[05]	3	3
Q - 2 (b)	Explain the working of a rotary drum filter with a neat sketch and specify the fields of application	[05]	5	3
Q - 3 (a)	Discuss power consumption in agitated vessel with relevant equations.	[05]	3	3
Q - 3 (b)	What is fluidization? Discuss the conditions for fluidization	[05]	2	1
	OR			
Q - 3 (a)	Explain Filter aid, Filter medium in details	[05]	5	1
Q - 3 (b)	Enlist different parameters affecting rate of filtration	[05]	5	1
Q - 4	Attempt any one/two.	[05]		
(i)	Differentiate between clarifier and classifier along with their working principle		4	3

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CO : Course Outcome Number BTL : Blooms Taxonomy Level

Level of Bloom's Revised Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create