Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V EXAMINATION – WINTER 2025

Subject Code:3150502 Date:21-11-2025

Subject Name: Mechanical Operations

Time: 10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Discuss the characterization of solid particles.	**03**
	(b)	Define sphericity. Calculate the sphericity of a solid particle of cubical shape.	**04**
	(c)	Describe the working and construction of Trommels with neat sketch.	**07**
Q.2	**(a)**	Which analysis is more preferable differential or cumulative? How?	**03**
	(b)	A set of crushing rolls of 1000 mm diameter by 375 mm width of face. Minimum spacing between two rolls is 10 mm and the angle of nip is 30. What is the maximum permissible size of feed?	**04**
	(c)	Classify comminuting equipment and give suitable industrial application of it.	**07**
		OR	
	(c)	A Black jaw crusher is used for crushing limestone such that the average size of the particles is reduced from 50mm to 12 mm with energy consumption of 50 W*hr/metric ton. Calculate the energy consumption for crushing the same material from average size of 75mm to 20mm. (a) Using Rittinger's law; (b) using Kick's law (c) Bond's law. Work index=12.74.	**07**
Q.3	**(a)**	Discuss the classification of filtration with suitable examples.	**03**
	(b)	Discuss Filter media and Filter aids.	**04**
	(c)	Explain construction and working of continuous rotary drum filter.	**07**
		OR	
Q.3	**(a)**	Differentiate clarifier and classifier.	**03**
	(b)	Explain construction and working of the Hydrocyclones separator.	**04**
	(c)	Explain in detail the working of batch sedimentation with application.	**07**
Q.4	**(a)**	Discuss importance of mixing and agitation.	**03**
	(b)	Write short note on ribbon blender.	**04**
	(c)	Describe the different mixing equipments used for solid mixing in brief.	**07**
		OR	
Q.4	**(a)**	Enlist different types of flow pattern induced in an agitated vessel.	**03**
	(b)	Write short note on equipment used for cohesive solid mixing	**04**
	(c)	Explain different types of impellers for agitation of liquids along with application.	**07**
Q.5	**(a)**	List out the advantages and disadvantages of fluidization.	**03**
	(b)	Discuss minimum fluidization velocity and pressure drop in fluidized bed with neat sketch.	**04**
	(c)	With neat sketch, explain pneumatic conveying system with advantages and disadvantages.	**07**

OR

Q.5	**(a)**	List different types of industrial conveyers.	**03**
	(b)	Discuss the different criteria's for selection of conveyors.	**04**
	(c)	Explain in detail: Types of fluidization.	**07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2024

Subject Code:3150502 Date:02-12-2024

Subject Name:Mechanical Operations

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Define (i) Volume surface mean diameter (ii) Mesh Number (iii) Screening	**03**
	(b)	Discuss various factors affecting on screening operation.	**04**
	(c)	Describe various laws for size reduction and write principle of comminution.	**07**
Q.2	**(a)**	Define (i) Agitation (ii) mixing (iii) power index	**03**
	(b)	Discuss types of impellers in details.	**04**
	(c)	Define Sphericity. Calculate the sphericity of cube.	**07**
		OR	
	(c)	Develop the equation for the calculation of effectiveness of the screen.	**07**
Q.3	**(a)**	Differentiate between ideal screen and actual screen.	**03**
	(b)	Explain: "For efficient grinding, ball mills must be operated at a speed less than the critical speed."	**04**
	(c)	Discuss minimum fluidization velocity and pressure drop in fluidized bed with neat sketch.	**07**
		OR	
Q.3	**(a)**	Discuss various mechanism of filtration in brief.	**03**
	(b)	Calculate the operating speed of the ball mill from 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.	**04**
	(c)	List different types of industrial conveyers and explain any one in detail.	**07**
Q.4	**(a)**	Enlist different types of flow pattern induced in an Agitated vessel contains liquid.	**03**
	(b)	Derive the mathematical expression for constant rate filtration.	**04**
	(c)	Explain the construction and working of trommels with the help of a neat sketch.	**07**
		OR	
Q.4	**(a)**	Write short note on types of fluidization.	**03**
	(b)	Differentiate between clarifier and classifier.	**04**
	(c)	Explain double arm kneading mixture in detail with neat sketch.	**07**
Q.5	**(a)**	Discuss Sink and float method.	**03**
	(b)	Explain in details about slurry transport.	**04**
	(c)	Explain construction and working of the Hydrocyclones separator.	**07**

OR

Q.5	**(a)**	Define mixing index and its significance.	**03**
	(b)	Discuss Industrial applications of fluidization.	**04**
	(c)	With neat diagram explain construction and working of continuous rotary vacuum filter.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2023

Subject Code:3150502 Date:11-12-2023

Subject Name: Mechanical Operations

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define volume surface mean diameter, volume mean diameter, mass mean diameter and arithmetic mean diameter.	**03**
	(b)	Define sphericity. Find the sphericity cylinder having D=H.	**04**
	(c)	Develop the equation for the calculation of effectiveness of the screen.	**07**
Q.2	**(a)**	Differentiate the Crusher and grinder	**03**
	(b)	A set of crushing rolls of 1000 mm diameter by 375 mm width of face. Minimum spacing between two rolls is 12 mm and the angle of nip is 30. What is the maximum permissible size of feed?	**04**
	(c)	Classify comminuting equipment and give suitable industrial application of it.	**07**
		OR	
	(c)	A Black jaw crusher is used for crushing limestone such that the average size of the particles is reduced from 50mm to 10 mm with energy consumption of 50 W*hr/metric ton. Calculate the energy consumption for crushing the same material from average size of 75mm to 20mm. (a) Using Rittinger's law; (b) using Kick's law (c) Bond's law. Work index=12.74.	**07**
Q.3	**(a)**	Discuss various mechanism of filtration in brief.	**03**
	(b)	Classify the Filtration equipments with examples in each category.	**04**
	(c)	Explain construction and working of continuous plate and frame filter press.	**07**
		OR	
Q.3	**(a)**	Differentiate clarifier and classifier.	**03**
	(b)	Explain construction and working of the cyclones separator.	**04**
	(c)	Explain in detail the working of batch sedimentation with application.	**07**
Q.4	**(a)**	Write down purpose of agitation	**03**
	(b)	Write short note on tumbler mixer.	**04**
	(c)	Describe the different mixing equipments used for solid mixing in brief.	**07**
		OR	
Q.4	**(a)**	What is power number and give its significance.	**03**

	(b)	Write short note on equipment used for non-cohesive solid mixing	**04**
	(c)	Explain different types of impellers for agitation of liquids along with application.	**07**
Q.5	**(a)**	Enlist the industrial application fluidization.	**03**
	(b)	Discuss minimum fluidization velocity and pressure drop in fluidized bed with neat sketch.	**04**
	(c)	With neat sketch, explain pneumatic conveying system with advantages and disadvantages.	**07**

OR

Q.5	**(a)**	List different types of industrial conveyers.	**03**
	(b)	Discuss the different criteria's for selection of conveyors.	**04**
	(c)	Explain in detail: Types of fluidization.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2022

Subject Code:3150502 Date:11-01-2023

Subject Name:Mechanical Operations

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define (1) Screen efficiency (2) Ideal screen (3) Specific surface area of mixture	**03**
	(b)	Define sphericity. Find the sphericity cylinder having D=H.	**04**
	(c)	Explain the construction and working of a trommels with the help of a neat sketch and enlist various trommels arrangement.	**07**
Q.2	**(a)**	A feed consists of 60% coarse particles, which are to be recovered. The oversize and undersize contain 20% and 90%, receptively, fine particles. What is the values of Y_A , Y_B and Y_C.	**03**
	(b)	What rotational speed in RPM would you recommend for a ball mill 1100mm in diameter charged with 70 mm balls? .	**04**
	(c)	Classify comminuting equipment and give suitable industrial application of it.	**07**
		OR	
	(c)	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	**07**
Q.3	**(a)**	Explain use of Filter aid with a suitable example.	**03**
	(b)	Classify the Filtration equipments with examples in each category.	**04**
	(c)	What is the differential settling method? Explain in detail the working of batch sedimentation with application.	**07**
		OR	
Q.3	**(a)**	Discuss Sink and float method	**03**
	(b)	Explain construction and working of the Hydrocyclones separator.	**04**
	(c)	Explain construction and working of continuous rotary vacuum filter.	**07**
Q.4	**(a)**	Write down purpose of mixing	**03**
	(b)	Differentiate agitation and mixing.	**04**
	(c)	Discuss selection criteria of agitator.	**07**
		OR	
Q.4	**(a)**	What is mixing index and its significance.	**03**
	(b)	Discuss different method for prevention of swirling and vortex formation in agitated tank.	**04**
	(c)	Describe the different mixing equipments used for solid mixing in brief.	**07**

Q.5	**(a)**	List different types of industrial conveyers	**03**
	(b)	Explain in detail the bucket conveyer.	**04**
	(c)	Explain in detail: Types of fluidization.	**07**

OR

Q.5	**(a)**	Enlist the industrial application fluidization.	**03**
	(b)	Discuss minimum fluidization velocity and pressure drop in fluidized bed with neat sketch.	**04**
	(c)	List different types of industrial conveyers and explain any one in detail.	**07**

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