SL-597

Seat No.	

Total No. of Pages : 2

S.E. (Chemical) (Part-I) (Semester-III) (Revised) Examination, May - 2017
MECHANICAL OPERATIONS
Sub. Code : 63425

Day and Date : Thursday, 18-05-2017 **Total Marks : 100**

Time : 2.00 p.m. to 5.00 p.m.

Instructions : 1) **Answer any three questions from each section.**
2) **Assume suitable data, if necessary.**

SECTION-I

Q1) a) Define. **[8]**

i) Average size ii) Volume surface mean diameter

iii) Mass mean diameter iv) Specific surface Area

b) Calculate the surface volume mean diameter (D_p) for the following particulate material.

Avg. Particle dia ($\bar{D}_{Pi}$)	528	264	132	66	44	
Mass of particle retained	25	37.5	62.5	75	50	**[10]**

Q2) a) Derive an expression for critical speed of ball Mill. **[8]**

b) Explain the difference between Jaw crusher and Gyratory Crusher. **[8]**

Q3) a) Explain the vibrating screen with neat sketch and include its, construction, working and applications. **[8]**

b) A crushing roll 1 m in diameter are set so that the crushing surfaces are 12.5 mm apart and the angle of nip is 31°, what is maximum permissible size of particle which should be fed to the rolls? **[8]**

P.T.O.

Q4) a) Explain the flow pattern in an unbaffled, baffled vessel and off center propeller with neat sketch. **[8]**

b) Derive an expression for mixing index for pastes and viscous masses. **[8]**

SECTION-II

Q5) a) State the three main groups of filters and explain the mechanisms of filtration with a neat sketch. **[8]**

b) Explain the mechanism of deep bed filtration with diagram. **[8]**

Q6) a) Explain the continuous thickner with neat sketch. **[10]**

b) Explain the Kynch theory of sedimentation. **[8]**

Q7) a) What are types of magnetic separators? Explain any one. **[8]**

b) Explain the principles of Forth flotation, Magnetic separator, heavy medium separation Gravity settling tank, Jigging & Scrubber. **[8]**

Q8) a) State the main reasons of removing particles from an effluent gas. **[8]**

b) Explain the liquid washing & also draw a neat sketch of spray washer. **[8]**

SF - 349

Total No. of Pages :3

Seat No.	

S.E. (Chem.) (Part - II) (Semester - III) (Revised) Examination, November - 2017
MECHANICAL OPERATIONS
Sub. Code: 63425

Day and Date :Thursday, 23 - 11 - 2017 **Total Marks : 100**
Time :10.00 a.m. to 1.00 p.m.

Instructions : 1) **Answer any three questions from each section.**
2) **Assume suitable data if necessary.**

SECTION - I

Q1) a) State the ways to measure the size and shape of irregular particles. **[8]**

b) State & explain the properties of solid masses. **[8]**

Q2) a) Give the classification of size reduction equipment. Explain fluid energy mill with neat sketch. **[8]**

b) A material is crushed in a jaw crusher such that the avg. size of particle is reduced from 50mm to 10mm with consumption of energy of $13.0\left(\frac{Kw}{kg/s}\right)$. What should be the consumption of energy needed to crush the same material of a avg. size 75mm to an avg. size of 25 mm. Assume

i) Rittinger's law.

ii) Kick's law applicable.

Which of these results would be regarded as being more reliable ? why? **[10]**

P.T.O.

Q3) a) 1 ton/h of dolomite is produced by a mill operating in closed circuit with 100 mesh screen. The screen analysis (weight %) is given below. Calculate the screen efficiency. **[8]**

Mesh	35	48	65	100	150	200	–200
Feed	7.07	16.60	14.02	11.82	9.07	7.62	33.80
Oversize	13.67	32.09	27.12	20.70	4.35	2.07	0
Undersize	0	0	0	2.32	14.32	13.34	70.02

b) Give the list of Industrial screening equipment and explain any one in detail. **[8]**

Q4) a) Explain the mixing mechanism and state the difference between mixing and blending. **[8]**

b) Explain Ribbon blender with reference to its working, sketch, construction and applications. **[8]**

SECTION - II

Q5) a) Explain the washing mechanism of cake with sketch. **[8]**

b) What are the different materials for filter mediums? Also write down the properties required by a filter medium. **[8]**

Q6) a) Define sedimentation & explain basic principles of sedimentation. **[8]**

b) Explain the batch sedimentation test with diagram. **[10]**

Q7) a) Give the list of promoters, collectors, modifiers & frothing agents. **[8]**

b) Explain the Jigging. **[8]**

Q8) a) Explain the principle & types of impingement separators with neat sketch. **[8]**

b) Describe the Cyclone separators & its industrial applications. **[8]**

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S-2182

Seat No.	

Total No. of Pages : 3

S.E.(Chem.)-I (Revised)
Examination, December - 2015
MECH.OPERATIONS
Sub. Code : 63425

Day and Date : Monday, 14- 12 - 2015 **Total Marks : 100**

Time : 10.00 a.m. to 01.00 p.m.

Instructions : 1) **Answer any three questions from each section.**
2) **Assume suitable data if necessary .**

SECTION-I

Q1) a) Explain the shape and size of irregular particles. **[8]**

b) A sample of pyrite was screened. The screen analysis is given below.

Calculate i) Mean surface diameter ($\bar{D}s$)

ii) Specific surface.

Data:- sp. gr. of pyrite is 5.0. **[8]**

Q2) a) Derive an expression for crushing efficiency((ηc) . **[8]**

b) Calculate the operating speed of the ball mill Dia of ball mill=800 mm, Dia of ball=60 mm operating speed of mill is 55% less than critical speed. **[8]**

Q3) a) Explain with neat sketch. **[8]**

i) Trommel

ii) Vibrating screen

P.T.O.

b) A quartz mixture having the screen analysis as shown in table and is screened through a standard 14 mesh screen. Calculate the mass ratio of overflow and underflow and efficiency. **[10]**

Table:- Screen analysis.

Mesh No		4	6	8	10	14	20	28	35	65
Dp,mm		4.7	3.3	2.36	1.65	1.17	0.8	0.5	0.4	0.21
Cumulative wt.fraction	Feed →	0	0.02	0.15	0.47	0.73	0.88	0.9	0.96	0.98
	Overflow →	0	0.071	0.43	0.85	0.97	0.99	1.0	–	–
	→ Under flow	–	–	0	0.195	0.58	0.83	0.91	0.9	–

Q4) a) State the advantages of wet grinding. **[8]**

b) Explain the pug mill with diagram. **[8]**

SECTION-II

Q5) a) Define filtration and explain constant rate filtration and constant pressure filtration. **[8]**

b) State the principle of centrifugal filtration and explain the suspended batch centrifugal. **[9]**

Q6) a) Write in detail on a Dorr Thickner with a sketch and industrial application. **[8]**

b) Data for the filteration of $CaCO_3$ slurry in water at 25°C are reported as follows at constant pressure of 46.2 kN/m². The area of filtration was 0.0439m² and slurry concentration was 23.47 kg solid/m³ filterate Calculate the constant α and R_m. **[9]**

Data:-

$V\times10^3$	0.5	1.0	1.5	2.0	2.5	3.0
θ	17.3	41.3	72.0	108.0	152.0	201.7

$\mu = 8.86\times10^{-4}$ kg/m.s

Q7) a) Explain the hydrocyclone with neat sketch. [8]

b) Write in detail on a scrubber with diagram & state its advantage, disadvantage & industrial application. [8]

Q8) a) What do you mean by benefication process? Explain any one [8]

b) Explain the Electrostatic precipitators. [8]

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K - 321

Seat No.	

Total No. of Pages :3

S.E.(Chemical) - I Examination, 2013

MECHANICAL OPERATIONS

Sub.Code : 42725

Day and Date : Friday, 07 - 06 - 2013 **Total Marks : 100**

Time : 2.30 p.m. to 5.30 p.m.

Instructions: 1) Answer any three questions from each section

2) Attempt each question on separate page

3) Assume suitable data if necessary

SECTION - I

Q1) a) What are the various factors involved in characterisation of solid particles ? **[8]**

b) Calculate :

i) the sphericity of a cylindrical particle of having length is equl to its diameter of value 3cm.

ii) the sphericity of cube of size = 3cm. **[9]**

Q2) a) Differentiate the terms mixing of solids and mixing of low viscosity liquids with example. **[8]**

b) Explain the mixing mechanism involved in mixing of pastes,rubber and heavy plastic masses **[8]**

Q3) a) Illustrate the different ways of size reduction with example. **[9]**

b) Explain the size reduction mechanism in **[8]**

i) rod mill ii) ball mill

iii) tube mill iv) compartment mill

P.T.O.

Q4) a) Explain the motions of screens with neat diagram [8]

b) The screen analysis for a sample of crushed quartz is shown in table 1. Estimate

i) Average particle sizes of a product $\left(\overline{Ds}, \overline{Dw} \& \overline{Dv}\right)$

ii) Sp.surface area of product. [8]

Table 1 screen analysis for quartz sample

Mesh	Avg particle dia	Mass fraction
4/6	0.4013	0.0251
6/8	0.2844	0.125
8/10	0.206	0.3207
10/14	0.1409	0.257
14/20	0.1001	0.1590
20/28	0.0711	0.0538
28/35	0.0503	0.021

Data : Density of sample = 2.65g/cc

$\phi 3 = 0.571$

SECTION - II

Q5) a) Explain the filteration mechanism for [8]

i) cake filter

ii) clarifying filter

iii) cross how filter with neat sketches

b) A plate and frame press,filtering a slurry gave a total of 8 m^3 of filterate in 1800 sec,when filteration stopped.Estimate the washing time if 3 m^3 of wash water used .constant pressure is used. [9]

Q6) a) Explain the principle of clarifying filter [8]

b) What is the difference between cyclone separator and hydrocyclone ? Explain the construction and working of hydrocyclone. [8]

Q7) a) Discuss the basic principles involved in the benification of ores by froth flotation.with suitable examples Explain the roll of collectors frothing agents and modifiers in the operation. **[9]**

b) What is the principle of wet scrubbing ? State the types of scrubbers **[8]**

Q8) a) Explain the principle of bag filter and also Explain the unstruction and working of bag filter with a neat diagram. **[8]**

b) What is the principle of electrostastic precipitators ? and draw the diagram for. **[8]**

i) cylinder type precipitator

ii) Plate type precipitors

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N – 472

Seat No.	

S.E. (Chemical) (Semester – III) Examination, 2011
MECHANICAL OPERATIONS

Day and Date: Saturday, 14-5-2011 Max. Marks : 100
Time: 2.30 p.m. to 5.30 p.m.

Instructions: *1) Answer **any three** questions from **each** Section.*
*2) Assume suitable data if **necessary**.*

SECTION – I

1. a) Derive an expression for the total surface area of given fraction. 8
   b) Explain :
      i) Angle of repose
      ii) Angle of friction. 8

2. a) Derive an expression for the critical speed of a ball mill. 8
   b) A certain set of crushing roll has rolls of 100 cm diameter by 38 cm width face. They are set so that the crushing surfaces are 1.25 mm apart at the narrowest point. The angle of nip is 30°. What are the maximum permissible size of feed ? 9

3. a) Explain the screening motions with neat sketch. 8
   b) Explain the trammel with neat sketch and also mention its industrial applications. 8

4. a) Explain the :
      i) Turbine
      ii) Paddles
      iii) Propeller with neat sketches. 8
   b) Derive an expression for mixing index and its effectiveness. 9

P.T.O.

SECTION – II

5. a) Discuss the types of industrial filtration and explain the rotary drum filter with neat sketch. 9

   b) Explain :

      i) Filter aids

      ii) Filter medium selection 8

6. a) Explain the sedimentation process with neat sketch. 8

   b) Explain :

      i) Flocculation

      ii) Agglomeration. 8

7. a) Give the list of gas cleaning equipment and explain the momentum separator. 9

   b) What do you mean by impingement methods ? Explain any one equipment based on impingement method. 8

8. a) Compare the hydraulic jig with froth flotation cell. 8

   b) Hydrophilic and hydrophobic materials. 8