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Question Paper Code: 54903

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Elective

Chemical Engineering

15UCH403 - MECHANICAL OPERATIONS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

- For coarse reduction of hard solids, use CO1- R
(a) Impact (b) Attrition (c) Compression (d) Cutting
- The main size reduction operation in ultrafine grinders is CO1 -R
(a) cutting (b) attrition (c) compression (d) impact
- Which among the following is related to screening CO2- R
(a) Threshing (b) Woven hair mesh (c) Aperture (d) all of the above
- Which of the following crushers can be considered as a combination of a jaw crusher and a roller crusher ? CO2- R
(a) Rod mill (b) Gyratory crusher
(c) Fluid energy mill (d) Ball mill
- In continuous filtration (at a constant pressure drop), filtrate flow rate varies inversely as the CO3- R
(a) square root of the velocity (b) square of the viscosity
(c) filtration time only (d) washing time only
- Which of the following is a pressure filter ? CO3 -R
(a) Leaf filter (b) Plate and flame filter (c) Rotary drum filter (d) Sand filter
- Banburry mixers are used mainly in CO4- R
(a) pharmaceutical industries (b) plastic and rubber industries
(c) handling dry powders (d) none of these

8. Highly viscous liquids & pastes are agitated by CO4- R
 (a) propellers (b) turbine agitators
 (c) multiple blade paddles (d) none of these
9. The capacity of a belt conveyor depends upon two factors. If one is the cross-section of the load, the other is the _____ of the belt. CO5- R
 (a) speed (b) thickness (c) length (d) none of these
10. Helical screw blades are found in CO5 R
 (a) belt conveyor (b) screw conveyor (c) roller conveyor (d) bucket conveyor

PART – B (5 x 2= 10Marks)

11. Define volume surface mean diameter CO1 -R
12. Write a note on high gradient magnetic separator. CO2 -R
13. What is the function of filter aids? CO3- R
14. Define Froude number. CO4 -R
15. What are the general specifications about pneumatic conveyors? CO5 -R

PART – C (5 x 16= 80Marks)

16. (a) (i) Explain the operation of the ball mill. CO1 -App (10+6)
- (ii) Calculate surface volume diameter for the following particulate material.

Size range, μm	Mass of particles in the range gm
704-352	25
352-176	37.5
176-88	6.5
88-44	75
Pan	50

Or

- (b) Discuss about ball mill with neat sketch and derive the relation for critical speed CO1 -App (16)

17. (a) (i) Derive the expression for the screen effectiveness

CO2- App (8+8)

(ii) A quartz mixture having the screen analysis shown in the table is screened through a standard 10-mesh screen. The cumulative screen analysis of overflow and underflow are given in table. Calculate the mass ratios of the overflow and underflow to feed and the overall effectiveness of the screen.

Mesh	D_p, mm	Feed	Overflow	Underflow
4	4.699	0	0	-
6	3.327	0.025	0.071	-
8	2.362	0.15	0.43	0
10	1.651	0.47	0.85	0.195
14	1.168	0.73	0.97	0.58
20	0.833	0.885	0.99	0.83
28	0.589	0.94	1.00	0.91
35	0.417	0.96	-	0.94
65	0.208	0.98	-	0.975
Pan		1.00	-	1.00

Or

(b) Explain in detail the design consideration of cyclone separators and hydrocyclones

CO2- U (8+8)

18. (a) A filter press is used to filter a sludge forming a non uniform compressible cake .at a constant pressure difference, 6000 l of water .it proceeds exactly as filtration. The filtrate has the same properties as the wash water. Neglecting the resistance of filter cloth, calculate the washing time required. Given rate of washing = $\frac{1}{4}$ (final rate of filtration for a filter press)

CO3- Ana (16)

Or

(b) Explain in detail the principle and working of rotary drum filter with a neat diagram

CO3- U (16)

19. (a) Discuss in detail about various types of mixers available for blending and kneading

CO4- U (16)

Or

(b) Explain the different types and functions of impellers used in agitating liquids.

CO4- Ana (16)

20. (a) Discuss in detail about different conveyers in transporting solids in industries CO5 -U (16)

Or

- (b) Discuss the following with neat sketch CO5 -U (16)
- (i) Types of Bins
 - (ii) Flow problem in solids