Reg. No. : | | | | | | | | | | |

Question Paper Code: 50943

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Fourth Semester

Chemical Engineering

15UCH403 - MECHANICAL OPERATIONS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Which of following states that energy required for crushing will be function of logarithmic of feed and product size?

   (a) Kick's law (b) Rittenger's law
   (c) Bond's law (d) Work index

2. Size measurement of ultrafine particles can be best expressed in terms of

   (a) Centimeter (b) Screen size
   (c) Micron (d) Surface area/unit mass

3. Screen effectiveness is not a function of

   (a) Its opening size (b) Screening mechanism
   (c) Screening surface (d) Atmosphere humidity

4. Cyclones are used primarily for separating

   (a) Liquids form liquids (b) Solids form fluids
   (c) Solids for solids (d) All of these

5. Example of filter for continuous mode of filtration

   (a) plate and frame (b) spiral wound
   (c) rotary vacuum (d) tubular

6. During the initial stage of filtration of dilute slurry in downward facing surface giving rise to cake deposition at

(a) Low resistance (b) High resistance
(c) Contact resistance (d) None of these

7. In a mixing tank operating at very high Reynolds number ($>10^4$), if the diameter of the impeller is doubled (other conditions remains constant) the power required increases by a factor of

(a) 1/32 (b) 1/4 (c) 4 (d) 32

8. Mixing of plastic solids is generally facilitated by

(a) Dispersion (b) mastication
(c) kneading (d) diffusion

9. Conveyor which can be recommended for abrasive materials

(a) Belt (b) apron (c) flight (d) chain

10. Sticky materials are transported by

(a) Apron conveyor (b) Screw conveyor
(c) Belt conveyor (d) Hydraulic conveyor

PART - B (5 x 2 = 10 Marks)

11. Define sphericity.

12. List the factors to be considered when the material supplied into screening equipment.

13. Give the significance of coagulants used in filtration.

14. If the frequency (in terms speed) of the stirrer in a mixing tank is increased by a factor of 2 while all other parameters are kept constant, by what factor is the power requirement increased at high Reynolds number?

15. List out three equipment's used for storage of solids.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Analyze the differential and cumulative methods of analysis to determine the average particle size. (8)

(ii) Discuss the basic laws of crushing and grinding. (8)

Or

(b) (i) With a neat sketch, explain the principles and working of ball mill. (8)

(ii) Describe the method of sieve analysis for the determination of average particle size of a mixture. (8)

17. (a) (i) Explain the method of separating heavy medium using float and sink method. (8)

(ii) Discuss the grinding operation involved in hammer mill. (8)

Or

(b) (i) Explain with a neat diagram about the working principle and construction of an electro static precipitator. (8)

(ii) Explain in detail the principle and working of cyclone separator. (8)

18. (a) (i) Discuss the filtration equations used for batch filtration. (10)

(ii) Write a note on membrane filtration. (6)

Or

(b) (i) Explain the operational features of rotary drum filter with neat sketch. (10)

(ii) Discuss the basic principles of centrifugal filtration. (6)

19. (a) (i) Deduce the power correlation used for mixing and agitation. (10)

(ii) Discuss about the principle involved in kneading. (6)

Or

(b) (i) Explain the methods of prevention of swirling in agitated vessels. (8)

(ii) Discuss the performance characteristics of radial flow impellers. (8)

20. (a) Discuss about various types of conveyors used in process industries. (16)

Or

(b) Explain with a neat sketch the construction, working and application of a pneumatic conveyor and a bucket elevator. (16)

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