PARTICLES & FLUID PARTICLE PROCESSING
(CHEN 2101)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) On which of the following, K_f and K_k depends?
(a) Type of machine (b) Type of power
(c) Type of operation (d) Type of law

(ii) Centrifuge and automatic discharges are used for _____
(a) Crystalline and product removal (b) Amorphous and feed removal
(c) Crystalline and feed removal (d) Amorphous and product removal

(iii) Gizzlies are used for separating _____ solids.
(a) coarse (b) fine
(c) any size (d) micro

(iv) The capacity of a jaw crusher is ___
(a) 10 to 20 tons/hour (b) 50 to 60 tons/hour
(c) 100 to 500 tons/hour (d) 9 to 900 tons/hour

(v) Separation of materials into products based on the difference of their sizes is called
(a) sizing (b) sorting
(c) classification (d) flocculation

(vi) Diatomaceous earth is a
(a) Filter aid (b) Catalyst
(c) Filter media (d) Collector

(vii) In the Newton's Law region terminal velocity of particle is proportional to
(a) Square root of particle diameter (b) Particle diameter
(c) Square of particle diameter (d) Cube root of particle diameter

(viii) Short distance transportation of grain, gravel, sand, ash, asphalt etc. is done by using a _____ conveyor.
(a) Flight (b) slat or drag
(c) ribbon (d) screw

(ix) Equivalent diameter of a particle is the diameter of the sphere having the same
(a) ratio of surface to volume as the actual volume
(b) ratio of volume to surface as the particle
(c) volume as the particle
(d) none of these.

(x) The gross energy requirement is called as ___
(a) Work index (b) Power index
(c) Energy index (d) Final index

Group – B

2. (a) Discuss the operating principle of pneumatic and hydraulic conveyors. Define flight conveyor and it's important to handle solid particles.

(b) Describe the working principle of Trommels screen and Banana screen.

(4 + 2) + (3 + 3) = 12

3. (a) Write the names of the different methods of particle size analysis. Write the advantages and disadvantages of sieve analysis.

(b) Define sedimentation process. Describe the working principle of the sedimentation process.

(3 + 3) + (2 + 4) = 12

Group – C

4. (a) Define the law of comminution. What is the limitation of Kick's law and Rittinnger's law?

(b) A material is crushed in a jaw crusher in which feed of average size of 60 mm is reduced to 10 mm while consuming 15 kW/ (kg/s) energy. Compute the energy consumption to crush the same material pg 80 mm average size to 20 mm. Use Kick's and Rittinnger's Laws.

(3 + 3) + 6 = 12

5. (a) How to measure the specific surface area of a mixture of particles? Define sauter diameter.

(b) Define capacity and effectiveness. What is ideal screen?

(3 + 3) + (4 + 2) = 12

Group – D

6. (a) Describe the dynamic properties of the single particles. Define Stokes Law. Define Drag coefficient.

   (b) Bauxite ore, consists of bauxite and silica, is cleaned through water flowing in laminar zone in classifier. After cleaning three parts should appear: pure bauxite, pure silica and mixture of these. The size range of particle is 20-600 micrometer. Compute the size range of three parts. Densities of bauxite and silica are 2200 kg/m^3 and 2800 kg/m^3, respectively.

(2 + 2 + 2) + 6 = 12

7. (a) Define terminal settling velocity and its importance.

   (b) Describe classification and jigging. Write the names of the different classification equipment.

6 + 6 = 12

Group – E

8. (a) Write the names of different types of centrifugal separation equipments. Describe the working principle of cyclone separator with net schematic diagram.

   (b) Describe the different types of nanomaterial synthesis methods in a block diagram.

(3 + 3) + 6 = 12

9. (a) Describe the working principle of continuous rotary vacuum filter.

   (b) Describe the working principle of electrostatic precipitator with net schematic diagram.

6 + 6 = 12

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