

Printed Pages : 3



CH-303

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 151303

Roll No.

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B. Tech.

(SEM. III) (ODD SEM.) THEORY
EXAMINATION, 2014-15
MECHANICAL OPERATIONS

Time : 3 Hours]

[Total Marks : 100

- Note :**
- (1) Attempt all questions.
 - (2) Assume missing data if any

1. Answer any TWO parts: **10x2=20**
 - (a) What are the different methods of particle size measurement? What assumptions are made when using the sedimentation method for determination of particle size distribution?
 - (b) Describe diameters: equivalent volume diameter, equivalent surface diameter, equivalent surface-volume diameter. How will you describe the size of single particle (Regular and irregular)?
 - (c) For a give particle size distribution, the mode, the arithmetic mean, the harmonic mean and the quadratic mean all have quite different numerical values. How do we decide which mean is appropriate for describing the powder's behavior in a given process?

2. Answer any TWO parts: **10x2=20**
- (a) State and derive the expression for the three basic laws of size reduction. What is the size range of feed for their applicability?
 - (b) With the help of a neat sketch explain the working of Jaw crushers? What do you understand by size enlargement? Explain its scope.
 - (c) In a ball mill of diameter 2000 mm, 100 mm diameter steel balls are being used for grinding. Presently, for the material being ground, the mill is run at 15 rpm. At what speed will the mill have to be run if the 100 mm balls are replaced by 50 mm balls, all the other conditions remaining the same?
3. Answer any TWO parts: **10x2=20**
- (a) What are the different types of conveyors available for transportation of bulk solids? Explain any two of them.
 - (b) Explain with the aid of sketches what is meant by the terms mass flow and core flow with respect to solids flow in storage hoppers ? What are the different methods of storing solids?
 - (c) What is meant by weighing of bulk solids? Describe batch and continuous weighing techniques?
4. Answer any TWO parts: **10x2=20**
- (a) Explain the principle of magnetic separation methods and electrostatic precipitation?
 - (b) Describe the construction and working of scrubbers and Continuous thickeners?

- (c) A cyclone has an inlet width of 15 cm and the shortest length of 25 cm with diameter of 0.50 m, operates at five effective turns. The gas temperature is 345K and inlet velocity is 20m/s. Also, the average particle size is $10\ \mu\text{m}$ with particle density $1.2\ \text{g/cm}^3$. The viscosity of air at 345K is 0.0745 kg/m-h. Determine: (a) the cut diameter, d_{pc} ; (b) the separation factor, S ; (c) Pressure drop at $15\ ^\circ\text{C}$ and 1 atm ($\rho_g = 1.2041\ \text{kg/m}^3$). Is this a high efficiency cyclone?

5. Answer any TWO parts: **10x2=20**
- (a) With a neat sketch explain the working of a plate and frame filter press and rotary Vacuum filter.
- (b) Explain the different types of fluidization and state their conditions. State commercial applications of fluidized bed.
- (c) Explain the term 'Terminal Settling Velocity' of a particle. Derive the equation for the terminal settling velocity of a particle in Stoke's law and Newton's law range.
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