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## CM-4002-CBGS

### B.E. IV Semester

Examination, June 2020

### Choice Based Grading System (CBGS)

### Fluid Particle Mechanics

*Time : Three Hours*

*Maximum Marks : 70*

- Note :** i) Attempt any five questions.  
ii) All questions carry equal marks.  
iii) Draw neat sketch and assume suitable data wherever you required.

1. a) Explain the importance of screening operation in a process industry.  
b) How do we define particle size?
2. a) What is the sphericity of a cuboid whose length, breadth and depth are in the ratio of 3:2:1 ?  
b) Given the following sieve analysis:

Sieve size mm	1.00	0.50	0.25	0.125	0.063	Through 0.063
% Retained	0	11	49	28	8	4

Plot a cumulative sieve analysis and estimate the weight fraction of particles of sizes between 0.300 and 0.350 mm and 0.350 mm and 0.400 mm.

3. a) State and explain work index. Give general values of reduction ratio for crusher, grinder and ultra fine grinders.

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- b) A material is crushed in jaw crusher and the average size of particle reduced from 50 mm to 10 mm with consumption of energy of 13 kW/(kg/s). What will be the consumption of energy needed to crush the same material of average size 75 mm to an average size of 25 mm:
- Assuming Kick's law
  - Assuming Rittinger law
4. a) Calculate the critical speed in revolution per minute, of a ball mill with an internal diameter of 1200mm loaded with 70mm diameter.
- b) Sugar is ground from crystals of which it is acceptable that 80% pass a 500  $\mu\text{m}$  sieve (US Standard Sieve No.35), down to a size in which it is acceptable that 80% passes a 88  $\mu\text{m}$  (No. 170) sieve and a 5-horsepower motor is found just sufficient for the required throughput. If the requirements are changed such that the grinding is only down to 80% through a 125  $\mu\text{m}$  (No. 120) sieve but the throughput is to be increased by 50% would the existing motor have sufficient power to operate the grinder? Assume Bond's equation.
5. a) Describe the types of mixers for plastic mass.
- b) Estimate the power required by a three bladed square pitched 40 cm marine propeller rotating at 300 rpm in a 30% by weight sodium hydroxide solution at 250 C in an unbaffled tank of 3 m diameter and 2.5 m liquid depth. The specific gravity of sodium hydroxide solution at this temperature is 1.3 and its viscosity is 13 CP. The power function is 0.245. The constants  $a = 2.1$  and  $b = 18$ .
6. a) Define degree of mixing and rate of mixing.
- b) Write the essential features of ribbon blender and double-cone mixer.

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7. a) What are the various factors which affects the rate of filtration? Derive an expression to calculate the rate of filtration.
  - b) Define Free Settling, Hindered Settling, terminal velocity and coefficient of drag.
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8. a) Write the advantages and disadvantages of screw conveyor.
  - b) Describe with a neat sketch:
    - i) Particulate fluidization
    - ii) Aggregate fluidization

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