

**VIT**Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)107
30**Continuous Assessment Test -I (CAT-I) Fall Semester (2023-24)**

Course Name & code : Mechanical Operations & BCHE301L
 Programme Name & Branch : BTech & Chemical Engineering
 Class Number : VL2023240100101, VL2023240100105 & VL2023240100109
 Slot : B1+TB1 and B2+TB2
 Faculty Name : Dr. Babu Ponnusami, Dr. Pandurangan & Dr. Nagamalleswara Rao K
 Exam Duration : 90 Min Maximum Marks : 50

General instruction(s): 1. Answer all the questions
 2. Assume suitable data wherever required.

Q.No.	Question	Max Marks												
1.	Find the sphericity values for the following shape particles. (a) Cube (5M) (b) Hemisphere (5M)	10												
2.	What rotational speed, in revolutions per sec, would you recommend for a ball mill 1200 mm in diameter charged with 75 mm ball? In addition, explain what happens if the rotational speed exceeds the critical speed?	10												
3.	A sample of pyrite particles was screened. The screen analysis is given in the following table. Using the table, calculate the mass mean, volume mean, volume surface mean diameter. (3M+3M+4M) <table><tr><th>Size range in, μm</th><th>Mass of the particle in, gm</th></tr><tr><td>-704+352</td><td>25</td></tr><tr><td>-352+176</td><td>37.5</td></tr><tr><td>-176+88</td><td>62.5</td></tr><tr><td>-88+44</td><td>75</td></tr><tr><td>Pan</td><td>50</td></tr></table>	Size range in, μm	Mass of the particle in, gm	-704+352	25	-352+176	37.5	-176+88	62.5	-88+44	75	Pan	50	10
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4.	It is desired to crush 100 tons/h of phosphate rock from a feed size where 80% is less than 10.16 cm to a product where 80% is less than 0.3175 cm. The work index (W_i) for phosphate rock is 9.92. (a) Calculate the power required (5M) (b) Calculate the power required to crush the product further where 80% is less than 1000 μm . (5M)	10												
5.	(a) Explain the methods of material storage in industries and discuss about factors affecting the storage of solids in industries and elucidate problems faced while designing the storage vessels. (5M) (b) Explain about Open and Closed Circuit grinding Operations with neat flow diagram. (5M)	10												