Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov/Dec - 2017**

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|  |  |  |  |
| **Code :** | **14BT2022** | **Duration :** | **3hrs** |
| **Sub. Name :** | **UNIT OPERATIONS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** |  | **Questions** | | **Course**  **Outcome** | **Marks** |
| 1. |  | A material is crushed in a blake jaw crusher and the average size of particle is reduced from 5cm to1.3cm with consumption of 37 w.hr/mt. what will be the consumption of energy necessary to crush the same material of average size 8cm to an average size of 3cm? You may assume that the mechanical efficiency remains unchanged. Do the calculations using i. Rittinger’s law ii. Kick’s law. | | CO1 | 20 |
| (OR) | | | | | |
| 2. |  | Calculate the operating speed of the ball mill from the following data: Diameter of the ball = 50mm, Diameter of the ball mill = 400mm, if i. operating speed is 50% less than the critical speed of the mill. ii.critical speed is 40% more than the operating speed. | | CO1 | 20 |
|  |  |  | |  |  |
| 3. |  | Derive the material balance over a screen. | | CO1 | 20 |
| (OR) | | | | | |
| 4. |  | A dolomite mixture having the following screen analysis is screened through a standard 100 mesh screen. Calculate the effectiveness of the screen and the mass ratio of overflow and underflow to fluid. Screen analysis.   |  |  |  |  | | --- | --- | --- | --- | | Mesh | Feed (%) | Undersize (%) | Oversize (%) | | 35 | 7.07 | 13.67 | 0 | | 48 | 16.60 | 32.09 | 0 | | 65 | 14.02 | 27.12 | 0 | | 100 | 11.82 | 20.70 | 2.31 | | 150 | 9.7 | 4.35 | 14.32 | | 200 | 7.62 | 2.07 | 13.34 | | Pan | 33.80 | 0.0 | 70.02 | | | CO1 | 20 |
|  |  |  | |  |  |
| 5. |  | Determine terminal settling velocity from particle movement through a fluid? | | CO2 | 20 |
| (OR) | | | | | |
| 6. |  | A slurry containing 5 kg of water per kg of solids is to be thickened to a sludge containing 1.5 kg of water per kg of solids in a continuous operation. Laboratory tests using five different concentrations of the slurry gave the following results.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Concentration  (kg water/kg solid) | 5 | 4.2 | 3.7 | 3.1 | 2.5 | | Rate of sedimentation (mm/s) | 0.17 | 0.10 | 0.08 | 0.06 | 0.042 |   Calculate the minimum area of a thickener to effect the separation of 0.6kg of solid per sec. | | CO2 | 20 |
|  |  |  | |  |  |
| 7. |  | Derive the distribution of overall pressure drop in constant pressure and constant rate? | | CO3 | 20 |
| (OR) | | | | | |
| 8. |  | | Derive the power requirement of agitation and determine α,β,γ,δ in the following equation P = NαρβμγDδ | CO3 | 20 |
|  | | |  |  |  |
|  | | | **Compulsory**: |  |  |
| 9. |  | | A mixture containing 30% (by weight) of galena (specific gravity =7.5) and balance silica (specific gravity=2.65) is to be elutriated with water flowing at 0.006m/s. If the size distribution of the mixtures (valid for both components) is as given below and the flow zone is essentially laminar, what fraction of galena fed will be in the overhead and bottom products and what will be the mass fraction of galena (on dry basis) in the these products.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Particle size | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | | Mass fraction cumulative | 0.33 | 0.53 | 0.67 | 0.77 | 0.83 | 0.88 | 0.91 | 0.93 | 0.95 | | CO3 | 20 |

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