FACULTY OF SCIENCE & TECHNOLOGY

#### MIDLANDS STATE UNIVERSITY

**Mining and Mineral Processing Engineering Department**

**MINERAL PROCESSING 2**

**CODE: HMIE 321**

### SESSIONAL EXAMINATIONS

**DECEMBER 2016**

**DURATION: 3 HOURS**

**EXAMINER: Mr. I Nikai**

## INSTRUCTIONS

1. *Answer* ***All*** *questions*
2. *Total marks 100*

**Question 1**

1. With the aid of an equation, define concentration criterion as used in gravity separation. Also explain why gold panning is possible.

 [6 MARKS]

1. State any *four* advantages of gravity separation. [4 MARKS]
2. By considering a particle of mass $m$, density $ρ\_{s}$ settling at a velocity$ x$ in a viscous fluid of density $ρ\_{f}$ in a jig, show that its initial acceleration is given by:

$$\frac{dx}{dt}=\left(\frac{ρ\_{s}-ρ\_{f}}{ρ\_{s}}\right)g$$

Where $g$ is the acceleration due to gravity. Hence explain why it is good practice to screen the feed to jigs into different size ranges and treat these separately. [6 MARKS]

1. Briefly explainthe mechanisms by which inter-particular spacing is achieved in a jig. [4 MARKS]

**Question 2**

1. Define flotation and explain why it is the most important and versatile
mineral separation technique. [4 MARKS]
2. Discuss the three mechanisms of flotation. [6 MARKS]
3. Derive the Young-Dupre equation and explain the significance of the contact angle in froth flotation. [10 MARKS]

**Question 3**

1. Discuss the *three* mechanisms by which minerals are charged in electrical separation. [10 MARKS]
2. Discuss the design of a magnetic separator in detail. [10 MARKS]

**Question 4**

1. State any *four* requirements of a substance used as a medium in dense medium separation. [4 MARKS]

Table 1 shows the results of heavy liquid tests performed on a tin sample.

1. Complete the table.
2. If a separation density of 2.75 was chosen, calculate the grade of Sn in the sinks? [16 MARKS]

**Table 1: Heavy liquids test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Specific gravity Fraction** | **% Weight** | **% Sn in s.g fraction** | **Sn Units** | **% Sn** |
| **Incremental** | **Cumulative** | **Distribution** | **Cum. distribution** |
| -2.55 | 1.57 |   | 0.003 |   |   |   |
| 2.55-2.60 | 9.22 |   | 0.04 |   |   |   |
| 2.60-2.65 | 26.11 |   | 0.04 |   |   |   |
| 2.65-2.70 | 19.67 |   | 0.04 |   |   |   |
| 2.70-2.75 | 11.91 |   | 0.17 |   |   |   |
| 2.75-2.80 | 10.92 |   | 0.34 |   |   |   |
| 2.80-2.85 | 7.87 |   | 0.37 |   |   |   |
| 2.85-2.90 | 2.55 |   | 1.3 |   |   |   |
| +2.90 | 10.18 |   | 9.6 |   |   |   |
| Total | - | - |   |   | - | - |

**Question 5**

1. State the factors that affect the choice of a tailings dam site. [5 MARKS]
2. Discuss and illustrate the following methods of tailings dam construction stating the advantages and disadvantages if any:
3. Upstream method
4. Downstream method, and
5. Centre-line method. [15 MARKS]

**END OF PAPER**