

**Uva Wellassa University of Sri Lanka**  
**Faculty of Science and Technology**  
**Department of Science and Technology**  
**300 Level 2<sup>nd</sup> Semester Examination – Jan. / Feb. 2016**  
**MRT 361-2 Mineral Processing Methods**



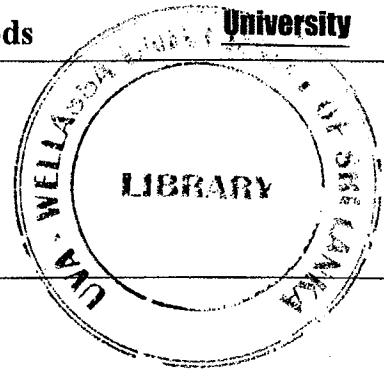
**Instructions to candidates**

**Duration:** Two (02) hours

**Number of questions:** Five (05)

**Answer only FOUR (04) questions**

**Mark allocation:** 400 Marks



(1)

- (a) Briefly discuss the main purposes of mass balancing in a mineral processing plant. Provide examples. [20 marks]
- (b) A Laboratory hydro-cyclone is fed with a slurry of quartz (density  $2700 \text{ kg/m}^3$ ) at a pulp density of  $1170 \text{ kg/m}^3$ . The under flow has a pulp density of  $1230 \text{ kg/m}^3$  and the over flow  $1095 \text{ kg/m}^3$ . A 5.5 liter sample of under flow was taken in 6 seconds. Calculate the mass flow rate of dry solid, under flow, over flow and feed to the cyclone. [45 marks]
- (c) (i) What is meant by dilution ratio? Briefly discuss with examples. [10 marks]
- (ii) Derive formulas for percentage solid by weight, mass flow rate of dry solid. [25 marks]

(2)

- (a)
- (i) Briefly discuss how to carry out a sieve analysis for a dry soil sample. [20 marks]
- (ii) List five advantages and disadvantages of dry and wet sieving. [20 marks]
- (iii) Drive a formula for the efficiency of industrial screenings. [20 marks]

(b) A sieve analysis was carried out on a sample of sand and results were as follows:

Size (microns)	Weight (g)
+710	40
-600, +425	24
-425, +325	30
-325, +212	52
-212, +180	22
-180, +125	20
-125, +90	30
Amount of loss=	12 g

(i) Using the graph paper provided, plot the graph of cumulative weight percent passing vs. particle size in microns. [20 marks]

(ii) Calculate retained weight of + 250 micron sieve. [20 marks]

(3)

(a)  
(i) Briefly explain magnetic separation methods. [10marks]

(ii) Briefly explain "*concentration criteria*" in mineral processing. [20 marks]

(b)

(i) Describe Stokes's and Newton's laws and discuss their limitations. [20 marks]

(ii) Calculate settling time of mineral particles in a slurry for following diameter sizes (d). [50 marks]

- Particle diameter (d): 40, 60, 600, 1000 microns
- Viscosity of slurry =  $1.015 \times 10^{-3}$  Pa.s
- Specific gravity of (X) mineral = 2.65
- Slurry height from bottom to top level of slurry = 80 mm
- Acceleration of gravity =  $9.8 \text{ m/s}^2$

(4)

(a)

(i) Discuss the importance of primary and secondary crushing in mineral processing industry with examples. [20marks]

(ii) Explain grinding mills with aid of diagram/s. [30 marks]

(iii) Design a quarry plant to obtain A, B, C and other fine aggregates, such as + 40mm, 16 to 20 mm and 5 to 10 mm sizes. [20 marks]

(b)

(i) Briefly explain the importance of liners.

[15 marks]

(ii) Derive a formula for the critical speed of the tumbling mill using a diagram.

[15 marks]

(5) Briefly explain any **Four** using diagrams if necessary,

(a) Meteorological balance in mineral processing industry.

(b) Hydro cyclone and its zones.

(c) Difference between High-tension separator and Gravity separation methods.

(d) Dewatering methods in mineral processing industry.

(e) Value addition process of minerals.

[25 x 4 marks]

