



FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF MINING ENGINEERING

MINING MINE GRAPHICS AND DESIGN EXAMINATION

EMI 3105

Examination Paper

June 2023

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: Mr N Ndlovu

Mr D Jaibes

INSTRUCTIONS

1. Answer **ALL** five questions.
2. Each question carries a total of 20 Marks.
3. Scientific calculators allowed to be used in this paper.

Additional Requirements

None

MARK ALLOCATION

Questions	Marks Allocated
Question 1 to 5	20
Total Attainable	100

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Question 1: Projections, Datum's and Marginal Information

- a) Write short notes on the following map projections:
 - (i) Planar. [4 Marks]
 - (ii) Orthographic or Azimuthal. [4 Marks]
 - (iii) Cylindrical. [4 Marks]
- b) State the four types map projections distortions. [4 Marks]
- c) Explain how each distortion is addressed in different projections. [4 Marks]

Question 2: Application Software in Mine Graphics & Design

Critical review the role of *marginal information* in light of proliferation Global Position System on most electronic devices. [20 Marks]

Question 3: Planimeters, Area and Volume Computations & Earthworks

- a) Discuss the operational difference between Mechanical and Digital planimeter. [6 Marks]
- b) What is the area of a piece of land which has a plan area of 1613 mm² as measured by a fixed arm planimeter if the scale plan is 1:2500. [2 Marks]
- c) An embankment is formed on a level ground which is a level transverse to the embankment but falling 1 in 20 longitudinally so that three sections 20m apart have centre height of 6.0m, 7.6m & 9.2m respectively above original ground level. If side slope of 1 in 1 are used determine the volume of fill between outer sections when the formation width is 6m using trapezoidal rule. [6 Marks]
- d) Using the data of in part (c) above solved by end area method, compute volume by prismoidal method formula. [6 Marks]

Question 4: Irregular Area and Volumes Computation from Simpson Rule and Contours

- a) Measurements were made from a survey line to an irregular boundary as follows:

Chainage (m)	0	10	20	30	40	50	60	70	80
Offset (m)	5.5	6.4	7.3	7.9	8.2	6.7	4.9	3.0	0.0

Calculate the area, using Simpson Rule, between the survey line and the boundary.

[5

MARKS]

- b) Coordinates (**E;N**) of corners of a polygonal area of a ground are taken, as follows in metres: **A(0,0)**; **B(-32,40)**; **C(-41,126)**; **D(14,200)**; **E(80,144)**; **F(108,62)**; **G(27,-19)** returning to **A**. Calculate the area enclosed. **[5 MARKS]**
- c) Tabulated below are the areas within the contour lines at a site of a reservoir, obtained by a planimeter from a plan of scale 1: 1000.

Contour (m AOD)	48	50	52	54	56	58	60
Area (mm ²)	16 900	40 290	56 775	61 835	70 970	79 355	85 160

If the lowest draw off level is 48m AOD and maximum top water level 60m AOD. Estimate the full storage capacity. **[10 MARKS]**

Question 5: Mine Design & Volumes from Spot Heights, B/holes & Haul Mass Diagrams

Levelling is carried out in open cast coal site yielded the following results:

Easting	100	200	300	100	200	300	100	200	300
Northin	100	100	100	200	200	200	300	300	300
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Ground Level	87.6	89.6	90.0	88.4	89.7	90.8	89.3	90.6	91.9

- a) A borehole at coordinates (200,200) has revealed that the top of coal is 1.68m thick is located 8.4m below the ground level. The seam is known to dip toward the North at a gradient of 1:50. Calculate the volume of the overburden in the gridded area. **[10 MARKS]**
- b) If the ground level rises to the north at a mean gradient of 1:80 from 300 mN and the maximum ratio of overburden thickness to coal seam thickness for economic working is 15:1. Estimate the grid northing at easting 200m to which an east-west working face may be advanced before the site becomes un-economical. **[10 MARKS]**

***** THE END *****