NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

DEPARTMENT OF LAND AND SPATIAL SCIENCES

QUALIFICATION: BACHELOR OF QUANTITY SURVEYING, BACHELOR OF GEOINFORMATION TECHNOLOGY, BACHELOR OF LAND ADMINISTRATION, BACHELOR OF ARCHITECTURE, BACHELOR OF REGIONAL AND URBAN PLANNING, BACHELOR OF REGIONAL AND RURAL DEVELOPMENT	
QUALIFICATION CODE: 07BQOS, 07BGEI, 07BLAM, 07BARC, 07BURP, 07BROR	**LEVEL:** 5
COURSE: INTRODUCTION TO SURVEY AND MAPPING	**COURSE CODE:** ISM520S
SESSION: NOVEMBER 2024	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER

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THIS QUESTION PAPER CONSISTS OF 10 PAGES (Including this front page)

INSTRUCTIONS

1. Answer ALL the questions.
2. Write clearly and neatly.
3. Number the answers clearly.
4. Answers to calculations must be rounded off to three decimal places, excluding answers to co-ordinate conversions

PERMISSIBLE MATERIALS

1. Calculators and other drawing equipment

Question 1

Answer the following questions by selecting the correct statement for each: (10)

1.1. The position of a point may be determined by a variety of methods. Which of these methods uses distances to determing the position of a point?

a. Triangulation
b. Trilateration
c. Polar
d. Traverses

1.2. Which of the following instruments are used to determine the hieghts of points accurately?

a. Level
b. Measuring tape
c. Theodolite
d. Total station

1.3. Which of thse levels read a bar-coded staff using electronic laser methods?

a. Dumpy level
b. Automatic level
c. Tilting level
d. Digital level

1.4. For the Namibian LO co-ordinate system:

a. Any of the Y or X co-ordinate can be written first
b. It is convention that X is written first and Y second
c. It is convention that Y is written first and X second
d. This co-ordinate system does not use Y and X co-ordinates

1.5. One of these corrections are applied only to taped distances:

a. Scale enlargement
b. Reduction to mean sea level
c. Converstion to German legal Meter
d. Standard Temperature

1.6. Which of these is a method used to determine the horizontal distance and horizontal angle?

a. Polar
b. Join
c. Traverses
d. Trilateration

1.7. A traverse that ends at an unknown point is known as a:

a. Link traverst
b. Loop traverse
c. Open traverse
d. Closed traverse

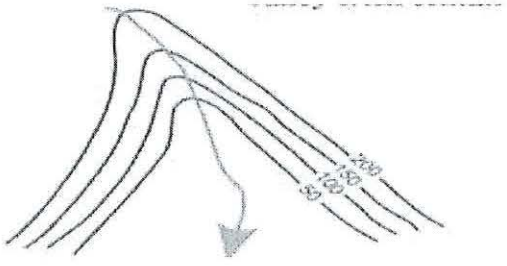
1.8. Which of these describes setting out?

a. Transferring positional values from plans to the ground
b. Transferring positional values from ground to plans
c. Determining positional values using survey software
d. Comparing measured and calculated values

1.9. DGPS stands for:

a. Distance Global Positioning System
b. Differential Geographic Positioning System
c. Distance Geographic Positioning System
d. Differential Global Positioning System

1.10. The picture below represents which natural feature?



a. Ridge
b. Valley
c. Vertical cliff
d. Pond

[10]

Question 2

2.1. What do the following acronyms stand for? (3)

a. RTK

b. GPS

c. EDM

(4)

2.2. Draw a table and compare Geodetic Surveying to Plane Surveying.

(3)

2.3. Match the correct letters to the correct numbers, explaining what each mean.

Word	Definition
A. Correction	1. Small discrepancy that remains after the correction has been applied to a reading.
B. Residual	2. Difference between a measured value and the true value of a reading or observation.
C. Error	3. Quantity that must be applied to the measured value to get the true value.

(3)

2.4. State the three basic principles that must always be applied during a levelling procedure.

(4)

2.5. Draw a sketch indicating the directions of increase and decrease for the co-ordinate values on the Namibian LO Co-ordinate System for both Y and X.

(3)

2.6. What are the requirements of a Reference Object?

(3)

2.7. List three different methods of determining distance

(3)

2.8. What are the three common corrections applied to both tape and electronic distance (EDM) measurements?

[26]

Question 3

3.1. Distinguish between a Closed Traverse and an Open Traverse. (4)

3.2. What type of traverse needs to be performend in order to be able to check the accuracy of the traverse? (1)

3.3. Explain horizontal and vertical setting out. (2)

3.4. Describe the procedure for horizontal setting out of a feature such as a road or a pipeline or a building or an erf, etc. (2)

3.5. What is the most accurate method for vertical setting out? (1)

3.6. What is the difference between Post–processing and Real Time Kinematic surveying styles. (2)

3.7. Briefly describe ANY TWO characteristics of Contours. (2)

[14]

Question 4

4.1 Given the field observations below and calculate the following:

a) The Co-ordinates of point BC14 (7)

b) The elevation of BC15 by using trigonometrical heighting (3)

@STN4

HI= 1.524 **HT= 1.650**

Point	**HA**	**SD**	**VA**
BC11	297°14'07"		
BC14	338°45'18"	9.912	96°45'42"
BC15	357°57'14"	10.144	100°16'25"
RO	297°14'22"		

Co-ordinates

Name	Y	X	Z
STN4	- 4 086.567	+ 60 805.441	1700.562

4.2 Given the field observations below (Circle left and Circle right observation). Calculate final observed directions. Complete in column form using table 1 on data sheet 1. (6)

@RM3 HI= 1.433m

Point	Circle Left	Circle Right
Win3	100°50'50"	280°50'57"
A	177°27'19"	357°27'10"
Win5	223°01'02"	43°00'53
RO	100°50'45"	280°50"55"

4.3 A land surveyor oriented the instrument approximately 0° South and as we know the final observed direction cannot be used to calculate Y, X co-ordinate values. Therefore, calculate the Oriented Direction from the instrument setup point RM1 to MAK1 using the data below. Complete in column form using table 2 on data sheet 1. (11)

Co-ordinates

	Y	X
RM1	-4 109.945	+60 798.677
STN1	-4 117.683	+60 844.044
STN2	-4 092.943	+60 808.576

@RM1

Point	Final Observed Direction
STN1	**345°08'54"**

STN2 **54°37'02"**

MAK1 **50°29'39"**

4.4 The levelling field observations on data sheet 2 were carried out by a Land Surveyor at a construction site. Reduce the data sheet using the "RISE and FALL" method to determine the final heights. All checks need to be shown and the correction needs to be distributed. (10)

[37]

Question 5

5.1 A field traverse was carried out by a Land Surveyor to establish control points at a construction site. Calculate the field traverse using the Bowditch rule by completing the column form on data sheet 3. Calculate the linear accuracy and accuracy of the traverse at the end. (13)

[13]

Student Number_____ **Data Sheet 1**

Question 4.2

Table 1: Final Observed Direction

@RM3

Point	Circle Left	Circle Right	Mean	Correction	Final Observed Direction
Win3	100°50'50"	280°50'57"			
A	177°27'19"	357°27'10"			
Win5	223°00'56"	43°00'53			
RO	100°50'45"	280°50"55"			

Question 4.3

Table 2: Oriented Direction

Point	Final Observed Direction	Join	Difference / Correction	Oriented Direction
STN1	345° 08' 54"			
STN2	54° 37' 02"			
MAK1	50° 29' 39"			

Student Number_____ **Data Sheet 2**

Question 4.4

Rise and Fall Method

Point	Back Sight	Intermediate Sight	Fore Sight	Rise	Fall	Reduced Level	Correction	Adjusted Levels
BM1	0.585							100.000
1	1.855		2.955					
2		1.265						
3		2.925						
BM2			0.350					99.195

Student Number_____ **Data Sheet 2**

Question 5.1

Traverse Sheet

Bowditch Adjustment Sheet

Note: All answers must be rounded off to 3 decimal places

Horizontal Direction & Horizontal Distance	Join	ΔY	ΔX	Point ID	Final Co-ordinates Y	X
106° 25' 50" 121.030				821D	+5601.500	+5516.780
153° 37' 13" 128.440				T1		
195° 11' 16" 129.790				T2		
				SBE	+5740.970	+5242.180