



PAMIBIA 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 TOWN AND REGIONAL PLANNING	
QUALIFICATION CODE: 07BQOS, 07BGEI, 07BLAM, 07BARC, 07BTAR	LEVEL: 5
COURSE: INTRODUCTION TO SURVEY AND MAPPING	COURSE CODE: ISM520S
SESSION: NOVEMBER 2023	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 result of all observations e.g. a mean distance or angle, taking all readings/observations into account is known as a:
 - a. Measurement
 - b. Levelling
 - c. Observation
 - d. Correction

- 1.2. The difference between the measured value and the true value of a reading or observation is called the:
 - a. Correction
 - b. Error
 - c. Residual
 - d. Parallax

- 1.3. Which of the following instruments can only measure angles?
 - a. Total Station
 - b. Level
 - c. Theodolite
 - d. GPS

- 1.4. For which of these levels are the telescope and vertical spindle cast as one piece?
 - a. Automatic Level
 - b. Tilting Level
 - c. Dumpy Level
 - d. Digital Level

- 1.5. Which among the following is one of the principles of leveling?
 - a. Taking measurements
 - b. Covering entire area
 - c. Determining the DY and DX differences
 - d. Never move both the staff and the instrument at the same time

- 1.6. Parallax can be eliminated by focusing the eye piece and objective.
- True
 - False
 - Maybe
 - None of these
- 1.7. Close contours of decreasing values towards their centre, represent a
- Hill
 - Depression
 - Saddle
 - River bed
- 1.8. Contours of different elevations may cross each other only in the case of an
- Over hanging cliff
 - Vertical cliff
 - Pass
 - Valley
- 1.9. The Reference object in angular observations must fulfil the following requirement(s):
- It must be a well-defined point
 - It must not be too close or too far
 - It does not have to have co-ordinates
 - All the above
- 1.10. A permanent reference point or mark, of known height above a datum, is called
- Reference point
 - Bench mark
 - Datum point
 - Witness mark

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Question 2

- 2.1. Define the term "Surveying". (2)
- 2.2. Differentiate between a map and a plan. (2)
- 2.3. There are TWO principal classifications of surveying. Name and fully explain both. (4)
- 2.4. List three checks for blunders done during levelling calculation? (Write down the formulas) that should result in the same answer. (3)
- 2.5. What are the following called? (2)
- a. Determining the reduced level of a point that is above the line of sight of the instrument such as a ceiling, underside of a bridge, balcony, roof of underground mine etc. The staff is turned upside-down, the bottom of the staff is placed against the point/mark for which the reduced level needs to be determined, and a reading is taken.
 - b. A true to scale representation of features on the ground.
- 2.6. Draw and label the axes (orientation) of the Namibian LO coordinate system. Indicate the signs for both Y and X in each quadrant. (4)
- 2.7. What are the purposes of a Reference Object (R/O)? (3)
- 2.8. Explain why slope corrections must be applied to EDM measurements. (3)
- 2.9. List three of the corrections applied to tape-measured distances. (3)

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Question 3

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

- 3.2. Describe the procedure for horizontal setting out of a feature such as a road or a pipeline or a building or an erf, etc. (4)
- 3.3. List two advantages and two disadvantages of using GPS/GNSS. (4)
- 3.4. Briefly describe ANY TWO characteristics of Contours. (2)
- [14]
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Question 4

- 4.1 The levelling field observations on Data Sheet 1 were carried out by a Land Surveying student doing in-service training at NAVACHAB GOLD mine. 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)
- 4.2 Given the field book below, calculate final observed directions from the Mean observed directions. Complete in column form using table 1. (6)

<u>@Res</u>	HI = 1.812m
Point/Station	Mean Observed Directions
Δ Uitdraai	137° 16' 04"
Δ Somnabab	243° 23' 21"
Δ Eises	0° 06' 00"
Fence	129° 11' 07"
RO	137° 16' 12"

- 4.3 Point P1 is at a reduced horizontal distance of 819.157 metres from RM1 and on a direction which can be reduced from the following horizontal angular observations. Determine the oriented direction to P1 by completing table 2 then calculate the co-ordinates of P1 using oriented direction. (16)

Co-ordinates

Name	Y	X
RM1	-2 756.460	+18 445.000
Δ Trig B	-1 961.570	+14 268.710
Δ Trig C	-6 520.650	+18 443.800

@ RM1 **HI = 1.656m**

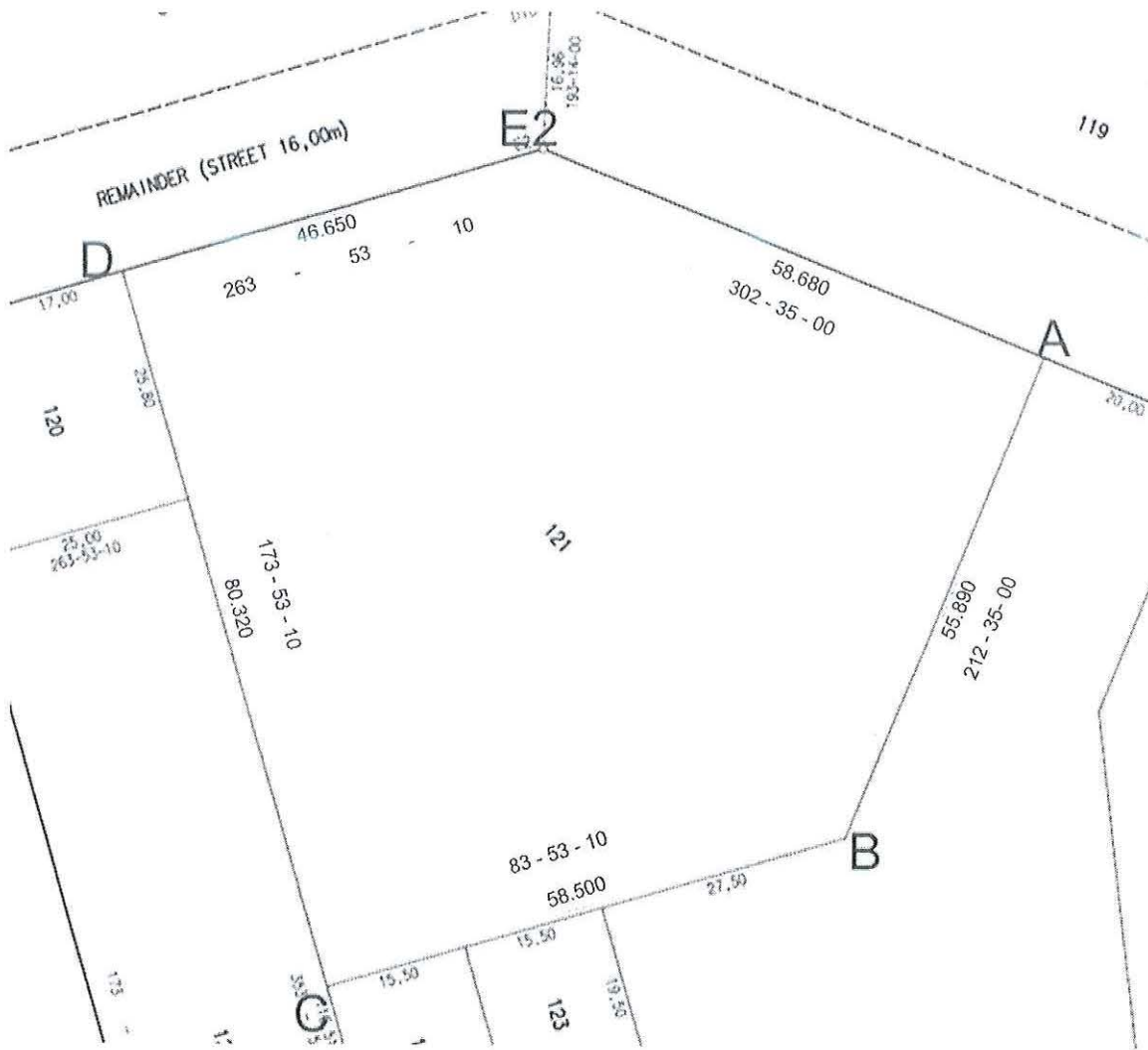
Point/Station	Fin. Observed Dir.
Δ Trig B	169° 13' 53"
Δ Trig C	269° 59' 20"
P1	101° 43' 19"

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Question 5

- 5.1 Compute the data traverse shown below for ERF 121 starting at E2 and ending at D, using information from an excerpt of a plan as shown below. Determine final coordinates for points A, B and C. Use traverse sheet on data sheet 3 to answer this question. (18)

BLOCK CORNERS		
CO -ORDINATES		
System Lo 22/15°		
Constants	Y ± 0.00	X ± 0.00
A1	-75 169.220	-467 528.800
A2	-75 180.620	-467 536.710
A3	-75 214.910	-467 551.810
A4	-75 221.860	-467 519.900
E1	-75 519.010	-467 465.280
E2	-75 591.250	-467 473.020
E3	-75 682.630	-467 414.620
E4	-75 657.000	-467 374.510
D	-75 543.870	-467 467.940



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Student Number _____

Data Sheet 1

Question 4.1

Rise and Fall Levelling Sheet

NOTE: The BOLD and <u>Underlined</u> values are the Inverted Staff Readings.								
Answers should be to 3 (0.000) decimal places.								
Point	B.S.	I.S.	F.S.	Rise	Fall	Reduced Heights	Correction	Final Heights
A	3.565							
B	2.192		1.510					
C		3.077						
D		<u>-2.538</u>						
E	1.515		2.523					
F		0.735						
G		1.860						
H			0.672					1299.070

Student Number _____

Data Sheet 2

Question 4.2Table 1: Final Observed directions

<u>@ Res</u>			
Point/ Station	Mean	Correction	Fin. Observed Direction
Δ Uitdraai	137° 16' 04"		
Δ Somnabab	243° 23' 21"		
Δ Eises	0° 06' 00"		
Fence	129° 11' 07"		
R/O	137° 16' 12"		

Question 4.3Table 2: Oriented Direction

<u>@ RM1</u>				
Name	Fin. Observed Direction	Join Direction	Difference / Correction	Oriented Direction
ΔTrig B	169° 13' 53"			
ΔTrig C	269° 59' 20"			
P1	101° 43' 19"			

Student Number _____

Data Sheet 3

Question 5.1

Traverse Sheet

Direction	Join	Differences		Point	Final Coordinates		
		ΔY	ΔX		Y	X	
Distance (m)				E2	-75591.250	-467473.020	
	NOT NECESSARY						
					A		
					B		
					C		
					D		
					D	-75543.870	-467467.940