



PANJAB UNIVERSITY
OF SCIENCE AND TECHNOLOGY
FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

DEPARTMENT OF LAND AND SPATIAL SCIENCES

QUALIFICATIONS: BACHELOR OF GEOMATICS	
QUALIFICATIONS CODES: 07BGEO	QUALIFICATION LEVEL: Level 7 - 07BGEO
COURSE CODE: ODC721S	COURSE NAME: Geodesy
DATE: December 2025	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER	
EXAMINER:	Dr J. Odumosu
MODERATOR:	Dr K. Owolabi

INSTRUCTIONS

1. Answer all questions.
2. Write clearly and neatly.
3. Marks will be deducted for poor writing, spelling and grammatical errors.
4. Number the answers clearly.
5. Make sure your Student Number is on the EXAMINATION BOOK(s).

THIS QUESTION PAPER CONSISTS OF 3 PAGES (Including this front page)

PERMISSIBLE MATERIAL
Calculator

QUESTION 1

Given the following gravity observations taken with a Scintrex CG5 gravimeter, compute the following at each station:

- 1.1 Drift.
- 1.2 Latitude.
- 1.3 Free-air Corrections.

Consequently, determine the final absolute gravity value for each station. (20)

Table 1: Gravity field notes

Sta_ID	Lat (φ)	Long (λ)	Height (m)	Dial Reading	Time of Observation	Absolute Gravity ($mgals$)
YT1/24	6.5085	3.3751	28.20	1580.8086	3/25/2017- 09:06	978119.857
GP01	6.5143	3.3769	30.7	1581.7569	3/25/2017- 09:23	
GP02	6.5251	3.3684	18.1	1582.9931	3/25/2017- 09:29	
GP03	6.5298	3.3683	18.8	1582.2448	3/25/2017- 09:37	
GP04	6.5251	3.3681	19.2	1582.3104	3/25/2017- 09:52	
GP05	6.5185	3.3169	30.65	1581.6923	3/25/2017- 10:04	
YT1/24	6.5085	3.3751	28.20	1580.8617	3/25/2017- 10:35	

Hints:

$$FA_{corr} = 0.3086h \text{ mgals}$$

$$Lat_{corr} = 0.000812 \times \sin(2\varphi) \text{ mgals/m}$$

[20]

QUESTION 2

For an ellipse, show that:

$$2.1 \quad \frac{b}{a} = \sqrt{(1 - e^2)} \quad (5)$$

$$2.2 \quad z = \frac{a^2 (1 - e^2) \sin \phi}{[1 - e^2 \sin^2 \phi]^{1/2}} \quad (15)$$

[20]

QUESTION 3

The following data were observed during astronomical observations to determine the azimuth of a line: Calculate the azimuth of the line. (20)

Observation schedule:

Lat = 45° 52' 15''S

Long = 11hr 22m 3.9s

Plate bubble = 20'' per division

Face	Object	HCR	VCR	Altitude	Plate bubble	App L std T
L	RM	348 11 10				
L	Sun	151 07 30	059 45 37		2.7 2.0	9hrs 00m
R	Sun	351 10 40	300 09 12		4.4 0.3	9hrs 03m
R	RM	168 11 11				

Take declination of the Sun as 11° 15' 48''S

[20]

QUESTION 4

- 4.1 Using relevant diagrams (where necessary), write an explanatory note on the concept of sidereal time. (10)
- 4.2 Using appropriate geodetic notations and illustrations, to differentiate between gravity anomaly and gravity disturbance. (10)

[20]

QUESTION 5

In your own words, discuss extensively on the Namibian Terrestrial Reference Frame. In your discussion, identify the choice of ellipsoid and reasons for it, and the reference frame itself (configuration, realization, observational methods, and recent adaptations). (20)

[20]