



**GWANDA STATE UNIVERSITY**

FACULTY OF ENGINEERING AND ENVIRONMENT

DEPARTMENT OF GEOMATICS AND SURVEYING

Satellite Geodesy

**ESG3207**

Final Examination Paper

**Time Allowed: 3 hours**

**Total Marks: 100**

**June 2025**

**Examiner's Name: Mr T.T Chigova**

**INSTRUCTIONS**

- 1. Answer all questions**
- 2. Each question carries 25**
- 3. Total marks 100**

This Examination paper consists of 4 pages

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<b>1a)</b>	Define the following terms as used in satellite Geodesy:	
	(i) Satellite Altimetry	<b>1</b>
	(ii) Satellite Laser Ranging (SLR)	<b>1</b>
	(iii) Apparent coordinate system	<b>1</b>
	(iv) Ionospheric and tropospheric delays	<b>2</b>

<b>b)</b>	Describe and explain these different fields of Satellite Geodesy, mentioning their applicability in various industrial sectors:	
	(i) Dynamic,	<b>5</b>
	(ii) Gravitational,	<b>5</b>
	(iii) Geometric	<b>5</b>

<b>c)</b>	A local construction contractor has been contracted to carry out a dam construction to improve the water supply for the local residence, and the current leading Civil engineer is without sufficient knowledge and skills on how he/she can utilize technology of satellite geodesy. As a newly recruited Geomatician, give a detailed account of how you can incorporate satellite geodesy technology in your works to attain the project deliverables within defined project constraints?	<b>5</b>
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<p><b>2a)</b></p>	<p>As a leading surveyor, you have been tasked to draft a survey methodology on how the survey solution are best provided for rehabilitation on Bulawayo - Victoria Falls road. Clearly, specify the <b>equipments' of your choice</b>, for various stages and justify how it achieves <b>sustainable land survey practices</b> over the traditional accessories that has been used in the field of geomatics and surveying.</p>	<p><b>15</b></p>
<p><b>b)</b></p>	<p>The orbital motion/constellation of satellites is believed to have been determined by multiple variables, of which the Keplerian laws have proven to be valid to some extent. If so, distinguish between these GNSS Systems: the GPS and GLONASS, on space segment establishment characteristics, and justify what was the need for such different variables when launching and establishing the satellites.</p>	<p><b>10</b></p>

<p><b>3a)</b></p>	<p>Explain the concept of Doppler effect, and how can a geomatician substantially reduce its effects?</p>	<p><b>8</b></p>
<p><b>b)</b></p>	<p>List the limitations in the process of differencing data, and how can geomatician substantially reduces their effects?</p>	<p><b>7</b></p>
<p><b>c)</b></p>	<p>Distinguish between double and triple differencing when carrying data manipulation and cleaning.</p>	<p><b>10</b></p>

4a)	Differentiate between GPS observables: the L1 and L2 signals.	6
b)	As a leading Surveyor, give a detail account of how do you substantially solve the integer ambiguity number in your GPS observables.	7
c)	Briefly describe the characteristics of a 50 MHz GPS data stream.	5
d)	As a consultant Geomatician, justify the benefits of integrating satellite geodesy observation data with terrestrial deformation monitoring surveys and precision farming.	7

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