



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF NATURAL RESOURCES AND SPATIAL SCIENCES**

**DEPARTMENT OF GEO-SPATIAL SCIENCES AND TECHNOLOGY**

<b>QUALIFICATION:</b> BACHELOR OF GEOINFORMATION TECHNOLOGY BACHELOR OF LAND ADMINISTRATION	
<b>QUALIFICATION CODE:</b> 07GITB 07BLAD	<b>LEVEL:</b> 6
<b>COURSE CODE:</b> GMN621S	<b>COURSE NAME:</b> GEOINFORMATION MANAGEMENT
<b>SESSION:</b> JANUARY 2020	<b>PAPER:</b> THEORY
<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 100

<b>SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER(S)</b>	<b>DR LAMECK MWEWA</b>
<b>MODERATOR:</b>	<b>DR THOMAS CHRISTIANSEN</b>

<b>INSTRUCTIONS</b>	
<ol style="list-style-type: none"><li>1. Fill in the exam sheet. Write your <u>student number</u> on each answer sheet used.</li><li>2. This exam paper has five questions. Answer ALL the questions.</li><li>3. Read each question carefully before attempting to answer.</li><li>4. Write clearly and neatly.</li></ol>	

**PERMISSIBLE MATERIALS**

1. Non-programmable Calculator
2. Ruler, Pen, Pencil, Eraser (rubber), Standard Normal Distribution Tables (attached)

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**THIS QUESTION PAPER CONSISTS OF (5) PAGES (Excluding this front page)**

**Question 1: GIS Implementation**

The establishment of a GIS is a complex process which needs careful planning, based on a thorough analysis of the respective institution and its requirements. This is influenced by the type, purpose and level of GIS implementation.

**1.1.** Give four reasons why proper planning of GIS is needed. (4)

**1.2.** List four main types of GIS implementation levels in an organisation. For each, explain what reasons could trigger the “Thinking about Implementing a GIS” at that level. (8)

**1.3.** The GIS planning and implementation methodology can be subdivided into four main phases and nine planning stages. Name and briefly explain the four phases. (8)

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**Question 2: GIS Project Planning and tools**

**2.1.** If you are hired as a consultant to implement a multi-user GIS for a very large organisation. List six main GIS aspects (or components) that you will need to consider in the planning process. (6)

**2.2.** The Logical Framework is an approach to project planning that was developed as a tool for detailed planning with clearly defined objectives that can be measured by using appropriate indicators. List the ten steps in the development of a logical framework in their correct logical sequence. (no explanations please). (10)

**2.3.** Draw a blank logical framework template (use any style that is commonly used). (4)

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**Question 3: GIS Data Characteristics and Quality Aspects**

The quality of an GIS analysis depends on the quality of data and the skills of the person doing the analysis. One of the characteristics of data that needs to be managed is errors.

- 3.1.** What is the difference between accuracy and precision of spatial data? Use a simple diagram or example to support your answer. (4)
- 3.2.** One of the aspects to consider when choosing remote sensing imagery as primary a primary data source is the four image resolutions. Discuss briefly the importance of knowing each of the resolutions in relation to amount and quality of the data. (8)
- 3.3.** You are a consultant hired to collect data for a GIS to produce urban development monitoring maps.
- a) Assuming you have to produce a map for a town planning firm. What would be the scale of the map if a 20m x 40 m erf is 10mm x 20mm on the map? (2)
  - b) Now that you have determine the scale of your map, what would be the perimeter in cm of a school sports field area on the map if the perimeter on the ground is 400m? (3)
  - c) Assume a person offers you a 3.6 Ha plot to buy and then shows you the location of the plot on a map with same scale as in (a). The plot which he shows you is a rectangular polygon and measures 8 cm x 10 cm on the map. By how much bigger or smaller (in ha) is this plot on the ground? (3)

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**Question 4: Spatial Data Infrastructure (SDI)**

Namibia is busy implementing a National Spatial Data Infrastructure (NSDI) Policy and the Namibia Statistics Agency (NSA) is mandated by the Statistics Act, No. 9 of 2011 to implement this.

- 4.1. Define what you understand by spatial data infrastructure (SDI) and name two types. (4)
- 4.2. State and describe briefly the two categories/classes of spatial data that one finds in the National Spatial Data Infrastructure in Namibia. Give one example of each type. (8)
- 4.3. Outline the relevance/importance issues of implementing of the NSDI in Namibia. (8)

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**Question 5: PERT and Critical Path Analysis**

You have been hired as a consultant to spearhead the implementation of a mobile GIS App for the NSA. After conducting a needs assessment and a technology development seminar, you came up with six activities and their duration (in days) as shown in the table below.

Task	Description	Predecessor	O	M	P	T <sub>E</sub>	$\sigma_{Path}^2$
A	Develop specification		5	7	9		0.44
B	Write test plans	A	18	23	30		4.00
C	Design Mobile App	A	12	14	17		0.69
D	Write software code	B	17	22	28		3.36
E	Test the App	C	16	23	27		3.36
F	Deploy the App	D,E	22	26	30		1.78

- 5.1. Calculate the expected time for each activity (6)
- 5.2. Construct the PERT diagram (4)
- 5.3. Identify and determine the duration for the critical path (2)
- 5.4. Calculate the specified time if the probability of completing the project is 90% (4)
- 5.5. Calculate the probability of completing the project in 90 weeks? (4)

Below are the given formulae:

$$z = \frac{\text{specified time} - \text{critical path expected time}}{\text{path standard time}} = \left( \frac{DT - E_T}{\sqrt{\sigma_{\text{path}}^2}} \right)$$

Where **DT** = the specified time

**E<sub>T</sub> Path** = the expected completion time of the critical path

$\sigma_{\text{Path}}^2$  = variance of path

$$\text{Variance of each task, } \text{Var}^2 = \sigma^2 = \left( \frac{\mathbf{p} - \mathbf{o}}{6} \right)^2$$

Where **P** = pessimistic time and **O** = optimistic time and **M** = most likely time

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**STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.**

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997