namibia university
of science and technology

FACULTY OF ENGINEERING AND SPATIAL SCIENCES

DEPARTMENT OF ARCHITECTURE AND SPATIAL PLANNING

QUALIFICATION: BACHELOR OF GEOINFORMATION TECHNOLOGY	
QUALIFICATION CODE: 07BGEI	LEVEL: 7
COURSE CODE: GMN621S	COURSE NAME: GEOINFORMATION MANAGEMENT
DATE: JUNE 2022	PAPER: THEORY
DURATION: 3 Hours	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER:	MRS ROXANNE MURANGI
MODERATOR:	MR MIGUEL VALLEJO

INSTRUCTIONS
1. Write your student number on each answer sheet used.
2. Answer ALL the questions.
3. Read each question carefully before attempting to answer.
4. Write clearly and neatly.
5. Materials allowed: non-programmable calculator, Ruler, Pen, Pencil, Eraser (rubber), Standard Normal Distribution Tables

THIS PAPER CONSISTS OF FOUR (5) PAGES (EXCLUDING THIS COVER PAGE)

Question 1

Namibia has been experiencing rapid growth of informal settlements in urban areas. The causes of this problem have been researched and debated for a long time. You are part of the team that is conducting a desktop analysis to determine the causes of this problem. Answer the questions below.

1.1. Identify four main reasons/causes of informal settlement growth (i.e., 1st level).   (4)

1.2. For each of the main reasons/causes identify two sub causes (2nd level).   (8)

1.3. Develop a problem tree depicting the main problem, causes and effects of informal   (13)
     settlements in an urban area.

[25]

Question 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)

[8]

Question 3

Describe briefly what a "Needs Assessment "is and why it is done (max. four points for the
general explanation and max. six points for the description of its components).   (10)

[10]

Question 4

During the needs assessment, a GIS planner would conduct a technology seminar. Information Product Description (IPDs) is one of the main outputs of such a seminar.

4.1 What is the critical function of the IPDs in a GIS planning process?   (3)

4.2 What is the relation between IPD and MIDL?   (2)

4.3 List only six of the components of an IPD.   (3)

                                                                                             [8]

Question 5

The quality of a GIS analysis depends on the quality of data and the skills of the person doing the analysis.

5.1 Briefly explain the four main types of spatial errors that are possible in GIS.   (4)

5.2 For each error type, name one way how to minimize the error in a GIS database.   (4)

5.3 What is the difference between the accuracy and precision of spatial data?   (2)

                                                                                             [10]

Question 6

6.1 Briefly explain the four characteristics that influence data sources and design.   (4)

6.2 Explain the three common logical models for GIS Database designs.   (6)

                                                                                             [10]

Question 7

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.

7.1   State and describe briefly the two categories of spatial data that one finds in the National   (2)
      Spatial Data Infrastructure in Namibia. Give one example of each type.

7.2   Define what you understand by spatial data infrastructure (SDI) and name two types.   (2)

                                                                                                          [4]

Question 8

You are a consultant hired to collect data for a GIS for urban development monitoring. As part of your task, you are required to determine the appropriate scale and corresponding primary data sources.

8.1   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)

8.2   Now that you have determined 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?   (2)

8.3   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 the same scale as in (7.3). 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)

8.4   The maximum West-East extension of the NUST premises (including the Main Campus,
      the Sub-Campus, and the Hotel School) is about 900 m, The maximum north-south
      extension is about 400 m. Can you print the entire NUST Campus premises on a single
      DIN A 4 page at a scale of 1: 2,500?
      (Note: A DIN A 4-page measures 29.7 x 21 cm) Assume that 1 cm along all four edges
      cannot be printed!) Please motivate your answer with a comprehensible calculation!   (4)

                                                                                                          [11]

Question 9

After conducting a needs assessment and a technology development seminar for GIS for solid waste mapping and monitoring, you came up with six activities with their duration (in days) as shown in the table below. *Round off to two decimal places.*

Task	Predecessor	Optimistic Time, OT	Most likely Time, MT	Pessimistic Time, PT	Expected Time, ET	σ_{Path}^2
A		3	6	12		
B	A	5	11	7		
C	B	8	15	20		
D	C	5	14	18		
E	C	2	19	13		
F	D, E	14	15	22		

9.1 Calculate the expected time for each activity.   (2)

9.2 Calculate the variance of the paths.

9.3 Construct the PERT diagram.   (2)

9.4 Identify and determine the duration of the critical path.   (2)

9.5 Calculate the specified time if the probability of completing the project is 92%.   (3)

9.6 Calculate the probability of completing the project in 89 Days.   (3)

                                                                                                     [14]

Below are the given formulae to help you answer Question 9.

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

Where **DT** = the specified time

E_T Path = the expected completion time of the critical path

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

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

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