



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT**

**DEPARTMENT OF LAND AND SPATIAL SCIENCES**

<b>QUALIFICATION:</b> BACHELOR OF GEOINFORMATION TECHNOLOGY	
<b>QUALIFICATION CODE:</b> 07BGEI	<b>LEVEL:</b> 7
<b>COURSE CODE:</b> GMN621S	<b>COURSE NAME:</b> GEOINFORMATION MANAGEMENT
<b>SESSION:</b> JUNE 2024	<b>PAPER:</b> THEORY
<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 100

<b>FIRST OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER:</b>	Ms Roxanne Murangi
<b>MODERATOR:</b>	Dr Oluibukun Ajayi

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

<b>PERMISSIBLE MATERIALS</b>	
<ol style="list-style-type: none"><li>1. Non-programmable calculator.</li><li>2. Pen.</li><li>3. Pencil.</li><li>4. Eraser</li><li>5. Ruler.</li></ol>	

**This paper consists of six (6) pages (including this cover page).**

**Question 1**

1.1. Namibia has been experiencing rapid growth in informal settlements since independence. Many reasons have been attributed to this trend. The Namibian government has designed programmes and projects to reduce this trend. Using the management principles that you have studied, answer the following questions.

- a) Problem Tree Analysis: Identify four (4) main causes of informal settlement growth (i.e. 1st level). (4)
- b) For each of the main causes, identify two sub-causes (2nd level). (8)
- c) Objectives: Formulate the overall project objective and at least two purpose (specific) objectives to address the problem (short-term and medium-term objectives). Ensure the formulated objectives are 'SMART'. (6)
- d) Activities: Outline solutions/activities to achieve the formulated objectives. Provide at least two (2) sub-activities per objective. (9)
- e) Identify two (2) stakeholders for each of the following sections: (1. Beneficiaries/target group, 2. Implementers, 3. local financing agents, 4. decision makers). (8)

1.2. Give five (5) main reasons why proper planning is needed in GIS. (5)

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**Question 2**

- 2.1. The GIS planning and implementation methodology can be subdivided into four (4) main phases and nine (9) planning stages. Name and briefly explain the four (4) phases. (8)
- 2.2. Briefly explain the four (4) main types of spatial errors that are possible in GIS. (4)
- 2.3. Define what you understand by spatial data infrastructure (SDI) and name two (2) types. (6)
- 2.4. Explain the five (5) main elements or components of a Master Input Data List. (10)

**[28]****Question 3**

- 3.1. You are a consultant hired to collect data for a GIS for urban development monitoring. As part of your task, you must determine the appropriate scale and corresponding primary data sources. Assuming you must produce a map for a town planning firm. What would be the scale of the map if a 20 m x 40 m erf is 10 mm x 20 mm on the map? (2)
- 3.2. 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 1200 m? (2)
- 3.3. Assume a person offers you a 6.3-hectare (Ha) plot to buy and then shows you the location of the plot on a map with the same scale as in (3.1). The plot which he shows you is a rectangular polygon and measures 25 cm x 50 cm on the map. By how much bigger or smaller (in ha) is this plot on the ground? (4)

3.4. Let us assume that one of the important regular outputs of your GIS will be thematic maps of an area which measures exactly 35 km in North-South and 65 km in the East-West direction. Let us also assume that you have a printer that can only print up to a maximum format of DIN A2 (420 mm x 594 mm) and that a strip of 1 cm on all four sides of the A2 sheet cannot be printed. What would be the maximum scale at which you could print these maps, showing the entire 25 km x 55 km area on one DIN A2 sheet? Note: A correct final figure result will only be counted if it is accompanied by a reproducible and correct calculation. (4)

[12]

**Question 4**

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 produced seven activities and their duration (in weeks) as shown in the table below. Round off to two decimal places.

Task	Predecessor	Optimistic Time, O <sub>T</sub>	Most Time, M <sub>T</sub>	Pessimistic Time, P <sub>T</sub>
A	-	13	15	26
B	-	17	14	29
C	-	22	1	18
D	A	24	14	33
E	B	17	1	15
F	C	16	15	33
G	C	22	7	23
H	E, F	16	10	20
I	D	10	12	33
J	H, G	18	15	29

- 4.1. Calculate the expected time for each activity. (5)
- 4.2. Calculate the variance for each activity. (5)
- 4.3. Construct the PERT diagram. (3)
- 4.4. Identify and determine the duration of the critical path. (1)
- 4.5. Calculate the probability of completing 48 weeks. (3)
- 4.6. Calculate the expected time if the probability is 95%. (3)

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Below are the given formulae to help you answer Question 4.

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

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

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



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