

**UNIVERSITY OF ESWATINI**  
**DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL SCIENCE AND**  
**PLANNING**

**MAIN EXAMINATION    DECEMBER 2019**

**B.Sc. and B.Sc. Ed. IV**

**TITLE OF PAPER            :**    **WATER RESOURCES PLANNING**

**COURSE NUMBER           :**    **GEP413**

**TIME ALLOWED            :**    **THREE (3) HOURS**

**INSTRUCTIONS            :**    **SECTION A IS COMPULSORY**  
**ANSWER ANY TWO (2) QUESTIONS FROM**  
**SECTION B. ILLUSTRATE YOUR ANSWERS**  
**WITH APPROPRIATE DIAGRAMS AND SHOW**  
**YOUR WORKING IN ALL CALCULATIONS**

**MARKS ALLOCATED        :**    **QUESTION ONE CARRIES 40 MARKS AND THE**  
**OTHER QUESTIONS CARRY 30 MARKS EACH**

**THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN**  
**GRANTED BY THE INVIGILATOR**

**GEP413: WATER RESOURCES PLANNING – DECEMBER 2019**

**SECTION A: COMPULSORY QUESTION**

**Question 1**

- a) 'Money has a time value'. Discuss the validity of the statement in the context of water resources planning. (8 marks)
- b) Differentiate between a sunk cost and a salvage value. (12 marks)
- c) An irrigation scheme is considering buying a water pump. Two alternatives are available as shown in the Table 1 below. Assuming an interest of 7% annually, use the uniform annual cash method to choose which water pump is the best alternative.

Table 1: Two alternatives for water pumps

	<b>Pump A</b>	<b>Pump B</b>
Initial cost	E7000.00	E5000.00
End-of-useful-life salvage value	E1500.00	E1000.00
Useful life, in years	12	6

(20 marks)

**(40 Marks)**

**SECTION B: ANSWER ANY TWO QUESTIONS**

**Question 2**

- a) Discuss the consequences of not planning in water resources. (10 marks)
- b) Discuss the stages of planning in the sector of water resources. (20 marks)

**(30 Marks)**

**Question 3**

- a) Explain the steps required in estimating rural water demand. (15 marks)
- b) The current population of a certain township is estimated to be 25 000. The water use is estimated to be 250 litres per capita per day. Estimate the water demand for the township in 2049 if the population growth rate is 2.9% per annum. (15 marks)

**(30 Marks)**

**Question 4**

Explain how you would determine the water requirement of a given crop. **(30 Marks)**

**Question 5**

- a) Distinguish between agricultural and hydrological droughts. (10 marks)
- b) Discuss approaches that can be implemented to mitigate drought in Eswatini. (20 marks)

**(30 Marks)**

7%

## End-of-Period Compound Interest Factors

7%

N	Single Payment		Uniform Payment Series				Arithmetic Gradient		N
	Compound Amount Factor F/P	Present Worth Factor P/F	Capital Recovery Factor A/P	Present Worth Factor P/A	Sinking Fund Factor A/F	Compound Amount Factor F/A	Present Worth Factor P/G	Uniform Payment Factor A/G	
1	1.070	.9346	1.0700	.935	1.0000	1.000	0	0	1
2	1.145	.8734	.5531	1.808	.4831	2.070	.873	.483	2
3	1.225	.8163	.3811	2.624	.3111	3.215	2.506	.955	3
4	1.311	.7629	.2952	3.387	.2252	4.440	4.795	1.416	4
5	1.403	.7130	.2439	4.100	.1739	5.751	7.647	1.865	5
6	1.501	.6663	.2098	4.767	.1398	7.153	10.978	2.303	6
7	1.606	.6227	.1856	5.389	.1156	8.654	14.715	2.730	7
8	1.718	.5820	.1675	5.971	.0975	10.260	18.789	3.147	8
9	1.838	.5439	.1535	6.515	.0835	11.978	23.140	3.552	9
10	1.967	.5083	.1424	7.024	.0724	13.816	27.716	3.946	10
11	2.105	.4751	.1334	7.499	.0634	15.784	32.466	4.330	11
12	2.252	.4440	.1259	7.943	.0559	17.888	37.351	4.703	12
13	2.410	.4150	.1197	8.358	.0497	20.141	42.330	5.065	13
14	2.579	.3878	.1143	8.745	.0443	22.550	47.372	5.417	14
15	2.759	.3624	.1098	9.108	.0398	25.129	52.446	5.758	15
16	2.952	.3387	.1059	9.447	.0359	27.888	57.527	6.090	16
17	3.159	.3166	.1024	9.763	.0324	30.840	62.592	6.411	17
18	3.380	.2959	.0994	10.059	.0294	33.999	67.622	6.722	18
19	3.617	.2765	.0968	10.336	.0268	37.379	72.599	7.024	19
20	3.870	.2584	.0944	10.594	.0244	40.995	77.509	7.316	20
21	4.141	.2415	.0923	10.836	.0223	44.865	82.339	7.599	21
22	4.430	.2257	.0904	11.061	.0204	49.006	87.079	7.872	22
23	4.741	.2109	.0887	11.272	.0187	53.436	91.720	8.137	23
24	5.072	.1971	.0872	11.469	.0172	58.177	96.255	8.392	24
25	5.427	.1842	.0858	11.654	.0158	63.249	100.676	8.639	25
26	5.807	.1722	.0846	11.826	.0146	68.676	104.981	8.877	26
27	6.214	.1609	.0834	11.987	.0134	74.484	109.166	9.107	27
28	6.649	.1504	.0824	12.137	.0124	80.698	113.226	9.329	28
29	7.114	.1406	.0814	12.278	.0114	87.347	117.162	9.543	29
30	7.612	.1314	.0806	12.409	.0106	94.461	120.972	9.749	30
31	8.145	.1228	.0798	12.532	.00980	102.1	124.655	9.947	31
32	8.715	.1147	.0791	12.647	.00907	110.2	128.212	10.138	32
33	9.325	.1072	.0784	12.754	.00841	118.9	131.643	10.322	33
34	9.978	.1002	.0778	12.854	.00780	128.3	134.951	10.499	34
35	10.677	.0937	.0772	12.948	.00723	138.2	138.135	10.669	35
40	14.974	.0668	.0750	13.332	.00501	199.6	152.293	11.423	40
45	21.002	.0476	.0735	13.606	.00350	285.7	163.756	12.036	45
50	29.457	.0339	.0725	13.801	.00246	406.5	172.905	12.529	50