UNIVERSITY OF SWAZILAND

DEPARTMENT OF GEORAPHY, ENVIRONMENTAL SCIENCE AND PLANNING

MAIN EXAMINATION: DECEMBER, 2011

B.Sc. IV

TITLE OF PAPER	:	WATER RESOURCES PLANNING
COURSE NUMBER	:	GEP 421
TIME ALLOWED	:	THREE (3) HOURS
INSTRUCTIONS	:	SECTION A IS COMPULSORY ANSWER 2 QUESTIONS FROM SECTION B ILLUSTRATE YOUR ANSWERS WITH APPROPRIATE DIAGRAMS
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

SECTION A: COMPULSORY QUESTION

Question 1

The Swaziland Rural Water Supply Corporation wants to purchase either a diesel engine or gasoline engine to drive a water pump. Either engine will provide satisfactory service. It has been established that the minimum attractive rate of return is 10% per year. Table 1 presents the data for the analysis. Determine which engine is more economically attractive using the annual cash flow method of analysis.

(40 marks)

Table 1: Data for the diesel and gasoline engines

	DIESEL ENG.	GASOLINE ENG.
1st Cost	E45,000.00	E30,000.00
Life	5 years	3 years
Salvage value	E6,500.00	E 2,500.00
Annual fuel costs	E8,500.00	E12,500.00
Annual O&M	E2,500.00	E 4,500.00

SECTION B: ANSWER ANY TWO QUESTIONS

Question 2

A rural community in the Lowveld has a population of about 6500 people. The rural water consumption per capita is 45 litres. Design a water supply scheme that would meet the demand till year 2031. (Hint: the population growth rate for Swaziland is 2.3%).

Question 3

Discuss the concept 'Water is an economic good'. **(30 Marks)**

Question 4

Discuss the importance of hydraulic structures in an irrigation scheme. **(30 Marks)**

Question 5

Discuss why planning is endless in the sector of water resources. **(30 Marks)**

Interest Per Period i = .10000

n	Single Payment: Compound Amount (F/P)	Single Payment: Present Worth (P/F)	Uniform Series: Sinking Fund (A/F)	Uniform Series: Capital Recovery (A/P)	Uniform Series: Compound Amount (F/A)	Uniform Series: Present Worth (P/A)	Gradient: Uniform Amount (A/G)	Gradient: Present Worth (P/G)	n
1	1.100	.9091	1.00000	1.10000	1.000	.909	.000	.000	1
2	1.210	.8264	.47619	.57619	2.100	1.736	.476	.826	2
3	1.331	.7513	.30211	.40211	3.310	2.487	.937	2.329	3
4	1.464	.6830	.21547	.31547	4.641	3.170	1.381	4.378	4
5	1.611	.6209	.16380	.26380	6.105	3.791	1.810	6.862	5
6	1.772	.5645	.12961	.22961	7.716	4.855	2.224	9.684	6
7	1.949	.5132	.10541	.20541	9.487	4.868	2.622	12.763	7
8	2.144	.4665	.08744	.18744	11.436	5.835	3.004	16.029	8
9	2.358	.4241	.07364	.17364	13.579	5.759	3.372	19.421	9
10	2.594	.3855	.06275	.16275	15.937	6.145	3.725	22.891	10
11	2.853	.3505	.05396	.15396	18.531	6.495	4.064	26.396	11
12	3.138	.3186	.04676	.14676	21.384	6.814	4.388	29.901	12
13	3.452	.2897	.04078	.14078	24.523	7.103	4.699	33.377	13
14	3.797	.2633	.03575	.13575	27.975	7.367	4.996	36.800	14
15	4.177	.2394	.03147	.13147	31.772	7.606	5.279	40.152	15
16	4.595	.2176	.02782	.12782	35.950	7.824	5.549	43.416	16
17	5.054	.1978	.02466	.12466	40.545	8.022	5.807	46.582	17
18	5.560	.1799	.02193	.12193	45.599	8.201	6.053	49.640	18
19	6.116	.1635	.01955	.11955	51.159	8.365	6.286	52.583	19
20	6.727	.1486	.01746	.11746	57.275	8.514	6.508	55.407	20
21	7.400	.1351	.01562	.11562	64.002	8.649	6.719	58.110	21
22	8.140	.1228	.01401	.11401	71.403	8.772	6.919	60.689	22
23	8.954	.1117	.01257	.11257	79.543	8.883	7.108	63.146	23
24	9.850	.1015	.01130	.11130	88.497	8.985	7.288	65.481	24
25	10.835	.0923	.01017	.11017	98.347	9.077	7.458	67.696	25
26	11.918	.0839	.00916	.10916	109.182	9.161	7.619	69.794	26
27	13.110	.0763	.00826	.10826	121.100	9.237	7.770	71.777	27
28	14.421	.0693	.00745	.10745	134.210	9.307	7.914	73.650	28
29	15.863	.0630	.00673	.10673	148.631	9.370	8.049	75.415	29
30	17.449	.0573	.00608	.10608	164.494	9.427	8.176	77.077	30
31	19.194	.0521	.00550	.10550	181.943	9.479	8.296	78.640	31
32	21.114	.0474	.00497	.10497	201.138	9.526	8.409	80.108	32
33	23.225	.0431	.00450	.10450	222.252	9.569	8.515	81.486	33
34	25.548	.0391	.00407	.10407	245.477	9.609	8.615	82.777	34
35	28.102	.0356	.00369	.10369	271.024	9.644	8.709	83.987	35
40	45.259	.0221	.00226	.10226	442.593	9.779	9.096	88.953	40
45	72.890	.0137	.00139	.10139	718.905	9.863	9.374	92.454	45
50	117.391	.0085	.00086	.10086	1163.909	9.915	9.570	94.889	50
55	189.059	.0053	.00053	.10053	1880.591	9.947	9.708	96.562	55
60	304.482	.0033	.00033	.10033	3034.816	9.967	9.802	97.701	60