

UNIVERSITY OF SWAZILAND

DEPARTMENT OF GEORAPHY, ENVIRONMENTAL SCIENCE AND PLANNING

MAIN EXAMINATION: DECEMBER, 2013

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.
THE REST OF THE 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**

- (a) Explain two methods of engineering economy analysis. (10 marks)
 - (b) What sum of money today is equivalent to E28,000.00 in 15 years from now if money on deposit earns interest at the rate of 10% compounded annually. (15 marks)
 - (c) Compute the annual cash flow of a water resources project which has an initial cost of E35,000.00 and annual operation and maintenance of E1250.00. The estimated useful life of this project is 25 years and the discounting interest rate is 10%. (15 marks)
- (40 marks)**

SECTION B: ANSWER ANY TWO QUESTIONS**QUESTION 2**

Explain the principle doctrines in water law. (30 marks)

QUESTION 3

- (a) Discuss the importance of treating wastewater. (10 marks)
 - (b) Distinguish between aerobic and facultative wastewater treatment processes. (20 marks)
- (30 marks)**

QUESTION 4

'Swaziland has plenty of water and yet it experiences water scarcity related problems'. Discuss. (30 marks)

QUESTION 5

Discuss the effectiveness of the SADC Protocol on sharing water resources in the region. (30 marks)

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Table 1

Interest Per Period $i = .10000$

n	Single Payment		Uniform Series				Gradient		n
	Compound Amount (F/P)	Present Worth (P/F)	Sinking Fund (A/F)	Capital Recovery (A/P)	Compound Amount (F/A)	Present Worth (P/A)	Uniform Amount (A/G)	Present Worth (P/G)	
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	.6837	.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	6.868	2.622	12.763	7
8	2.144	.4665	.08744	.18744	11.436	9.835	3.004	16.029	8
9	2.358	.4241	.07364	.17364	13.579	13.759	3.372	19.421	9
10	2.594	.3855	.06275	.16275	15.937	19.145	3.725	22.891	10
11	2.853	.3505	.05396	.15396	18.531	26.495	4.064	26.396	11
12	3.138	.3186	.04676	.14676	21.384	36.814	4.388	29.901	12
13	3.452	.2897	.04078	.14078	24.523	51.103	4.699	33.377	13
14	3.797	.2633	.03575	.13575	27.975	70.367	4.996	36.800	14
15	4.177	.2394	.03147	.13147	31.772	97.606	5.279	40.152	15
16	4.595	.2176	.02782	.12782	35.950	135.824	5.549	43.416	16
17	5.054	.1978	.02466	.12466	40.545	188.022	5.807	46.582	17
18	5.560	.1799	.02193	.12193	45.599	260.201	6.053	49.640	18
19	6.116	.1635	.01955	.11955	51.159	360.365	6.286	52.583	19
20	6.727	.1486	.01746	.11746	57.275	495.514	6.508	55.407	20
21	7.400	.1351	.01562	.11562	64.002	676.649	6.719	58.110	21
22	8.140	.1223	.01401	.11401	71.403	918.772	6.919	60.689	22
23	8.954	.1117	.01257	.11257	79.543	1248.883	7.108	63.146	23
24	9.850	.1015	.01130	.11130	88.497	1700.985	7.288	65.481	24
25	10.835	.0923	.01017	.11017	98.347	2310.077	7.458	67.696	25
26	11.918	.0839	.00916	.10916	109.182	3120.161	7.619	69.794	26
27	13.110	.0763	.00826	.10826	121.100	4200.237	7.770	71.777	27
28	14.421	.0693	.00745	.10745	134.210	5600.307	7.914	73.650	28
29	15.863	.0630	.00673	.10673	148.631	7400.370	8.049	75.415	29
30	17.449	.0573	.00608	.10608	164.494	9800.427	8.176	77.077	30
31	19.194	.0521	.00550	.10550	181.943	13000.479	8.296	78.640	31
32	21.114	.0474	.00497	.10497	201.138	17300.526	8.409	80.108	32
33	23.225	.0431	.00450	.10450	222.252	23000.569	8.515	81.486	33
34	25.548	.0391	.00407	.10407	245.477	30500.609	8.615	82.777	34
35	28.102	.0356	.00369	.10369	271.024	40000.644	8.709	83.987	35
40	45.259	.0221	.00226	.10226	442.593	97779.779	9.096	88.953	40
45	72.890	.0137	.00139	.10139	718.905	248663.863	9.374	92.454	45
50	117.391	.0085	.00086	.10086	1163.909	620000.915	9.570	94.889	50
55	189.059	.0053	.00053	.10053	1880.591	1600000.947	9.708	96.562	55
60	304.482	.0033	.00033	.10033	3034.816	4100000.967	9.802	97.701	60

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