

SECTION A: COMPULSORY QUESTION

Question 1

A certain river basin is prone to flooding. The average cost of annual flood damage is estimated to be E400,000.00. Two mutually exclusive alternatives have been proposed as flood mitigation measures. These alternatives are the construction of a dam at site X or site Y. The data for the above course of action are given below.

	Site X	Site Y
First initial cost	E3,000,000	E4,000,000
Annual flood damages	E 190000	E 125000
Annual O&M	E 190000	E 125000
Estimated useful life	100 years	100 years

Use the benefit-cost ratio method and an interest rate of 5% to determine which site is the most economically attractive. Table 1 contains the interest rate factors. **(40 marks)**

SECTION B: ANSWER ANY TWO QUESTIONS

Question 2

- (a) Explain the stages of planning in the sector of water resources. (15 marks)
 - (b) 'Planning can save money'. Discuss the validity of the statement. (15 marks)
- (30 marks)**

Question 3

Discuss the qualities of land suitable for irrigation. **(30 marks)**

Question 4

Discuss the importance of water law. **(30 marks)**

Question 5

- (a) Explain the flood mitigation measures. (15 marks)
 - (b) Explain the drought mitigation measures. (15 marks)
- (30 marks)**

Table 1 Interest rate factors for 5 percent

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	1.050	.9524	1.00000	1.05000	1.000	.952	.000	.000	1
2	1.102	.9070	.48780	.53780	2.050	1.859	.488	.907	2
3	1.158	.8638	.31721	.36721	3.152	2.723	.967	2.635	3
4	1.216	.8227	.23201	.28201	4.310	3.546	1.439	5.103	4
5	1.276	.7835	.18097	.23097	5.526	4.329	1.903	8.237	5
6	1.340	.7462	.14702	.19702	6.802	5.076	2.358	11.968	6
7	1.407	.7107	.12282	.17282	8.142	5.786	2.805	16.232	7
8	1.477	.6768	.10472	.15472	9.549	6.463	3.245	20.970	8
9	1.551	.6446	.09069	.14069	11.027	7.108	3.676	26.127	9
10	1.629	.6139	.07950	.12950	12.578	7.722	4.099	31.652	10
11	1.710	.5847	.07039	.12039	14.207	8.306	4.514	37.499	11
12	1.796	.5568	.06283	.11283	15.917	8.863	4.922	43.624	12
13	1.886	.5303	.05646	.10646	17.713	9.394	5.322	49.988	13
14	1.980	.5051	.05102	.10102	19.599	9.899	5.713	56.554	14
15	2.079	.4810	.04634	.09634	21.579	10.380	6.097	63.288	15
16	2.183	.4581	.04227	.09227	23.657	10.838	6.474	70.160	16
17	2.292	.4363	.03870	.08870	25.840	11.274	6.842	77.140	17
18	2.407	.4155	.03555	.08555	28.138	11.690	7.203	84.204	18
19	2.527	.3957	.03275	.08275	30.539	12.085	7.557	91.328	19
20	2.653	.3769	.03024	.08024	33.066	12.462	7.903	98.488	20
21	2.786	.3589	.02800	.07800	35.719	12.821	8.242	105.667	21
22	2.925	.3416	.02597	.07597	38.505	13.163	8.573	112.846	22
23	3.072	.3256	.02414	.07414	41.430	13.489	8.897	120.009	23
24	3.225	.3101	.02247	.07247	44.502	13.799	9.214	127.140	24
25	3.386	.2953	.02095	.07095	47.727	14.094	9.524	134.228	25
26	3.556	.2812	.01956	.06956	51.113	14.375	9.827	141.259	26
27	3.733	.2678	.01829	.06829	54.669	14.643	10.122	148.223	27
28	3.920	.2551	.01712	.06712	58.403	14.898	10.411	155.110	28
29	4.116	.2429	.01605	.06605	62.323	15.141	10.694	161.913	29
30	4.322	.2314	.01505	.06505	66.439	15.372	10.969	168.623	30
31	4.538	.2204	.01413	.06413	70.761	15.593	11.238	175.233	31
32	4.765	.2099	.01328	.06328	75.299	15.803	11.501	181.739	32
33	5.003	.1999	.01249	.06249	80.064	16.003	11.757	188.135	33
34	5.253	.1904	.01176	.06176	85.067	16.193	12.006	194.417	34
35	5.516	.1813	.01107	.06107	90.320	16.374	12.250	200.581	35
40	7.040	.1420	.00828	.05828	120.600	17.159	13.377	229.545	40
45	8.985	.1113	.00626	.05626	159.700	17.774	14.364	259.315	45
50	11.467	.0872	.00478	.05478	209.348	18.256	15.223	277.915	50
55	14.636	.0683	.00367	.05367	272.713	18.633	15.966	297.510	55
60	18.679	.0535	.00283	.05283	353.584	18.929	16.606	314.343	60
65	23.840	.0410	.00219	.05219	456.798	19.161	17.154	328.691	65
70	30.426	.0329	.00170	.05170	588.520	19.343	17.621	340.841	70
80	49.561	.0208	.00103	.05103	971.229	19.596	18.353	359.646	80
90	80.730	.0124	.00063	.05063	1594.607	19.752	18.871	372.749	90
100	131.501	.0076	.00038	.05038	2610.029	19.848	19.234	381.749	100