

UNIVERSITY OF BOLTON

**SCHOOL OF THE BUILT ENVIRONMENT &
ENGINEERING – RAK CAMPUS**

BSc(HONS) CIVIL ENGINEERING

SEMESTER THREE EXAMINATION 2010/2011

PROJECT MANAGEMENT

MODULE NO: BLT3026

Date: Friday 2 September 2011

Time: 1.00 pm – 3.00 pm

INSTRUCTIONS TO CANDIDATES:

There are **FOUR** questions.

Answer **ANY THREE** questions.

All questions carry equal marks.

This examination paper carries a total of 100 marks.

Marks for parts of questions are shown in brackets.

Annuity tables are attached.

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1. a. For a civil engineering project, many important decisions are made during the planning phase of the project cycle. Discuss, with particular reference to the role of the consulting engineer, the activities that take place during the planning phase. (10 marks)
- b. Discuss the role of the project manager from appointment during the early stages of the project to the completion of construction. (15 marks)

Total 25 marks

2. Describe the Value planning procedure, critically assessing the various tools and techniques that may be employed. **25 marks**

3. a. Describe and evaluate the Average Rate of Return method of investment appraisal. (6 marks)

- b. A civil engineering contractor is reviewing his plant maintenance policy. Currently he operates on an unplanned basis but feels that the use of either a corrective or a preventative system may be more advantageous. Projected costs of the alternative systems are shown in the table below.

yr	A, existing alternative	B, corrective alternative	C, preventative alternative
0	-	50,000	100,000
1	100,000	85,500	72,000
2	100,000	85,500	72,000
3	100,000	85,500	72,000
4	100,000	85,500	72,000
5	100,000	85,500	72,000

Carry out an investment appraisal using the internal rate of return technique. Comment on the results obtained and, given that the company requires a minimum rate of return for investment of around 11%, advise the company on the viability of the proposals.

(19 marks)

Total 25 marks

Please turn the page

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4. a. Describe an outline model of the decision making process.

(8 marks)

b. A contractor has been presented with an opportunity to participate in the development of a new type of structural frame. However, if he takes up this opportunity he would have to withdraw from his current operations and concentrate solely on the frame development.

As far as current operations are concerned, the contractor estimates there to be a 0.5 probability of working at present levels for the next 5 years with a profit of £50,000pa. He feels that workload could increase but also acknowledges a 0.2 probability of a long term recession.

In the event of an increase in work, the contractor could either buy in new equipment at a cost of £40,000 or hire the equipment as necessary. Purchase of new equipment would give a 0.8 probability of profits running at £70,000 for a 5 year period with a 0.2 probability of achieving £80,000pa over the same period. Hiring equipment over the 5 year period is likely to yield a profit of £65,000 each year.

Should a recession occur, the contractor could survive for 2 years on a return of £20,000pa. He would then face a decision between selling up or continuing in business. He reckons that he would recoup £80,000 on a sale. Should he decide to continue, he could either attempt to hire out his plant and make £30,000pa for three years or win sufficient contracts to provide profits of £20,000pa for the 3 year period. He rates the probabilities of these alternatives as 0.3 and 0.7 respectively.

If the contractor participates in the new frame initiative he will be faced with an immediate requirement to invest £50,000 towards development costs. He then considers there to be a 0.8 probability of the frame being successful with a 0.2 probability of failure.

If the venture is successful the contractor can envisage two scenarios. In the first case, against which he assigns a 0.3 probability, there would be a requirement for further investment of £100,000pa for two years as use of the frame is promoted, followed by 3 years when profits would run at £50,000pa. At the end of this period the contractor could sell his interests for £500,000.

Question 4 continued over the page...

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Question 4 continued

In the second instance the contractor can foresee a greater initial take up on the frame resulting in a 2 year period when there will be zero returns and at the end of which he would be able to dispose of his interests for a sum of £450,000.

By use of decision analysis technique, present the contractor's plans in a structured format and carry out a full analysis before identifying the option which will produce the highest expected monetary value.

Assume the cost of capital to the contractor to be 10%.

(17 marks)

Total 25 marks

END OF QUESTIONS

ANNUITY TABLES

TABLE I. TERMINAL VALUE OF A SINGLE SUM AT COMPOUND INTEREST

The amount to which £1 will increase in n years with interest rate r per annum $= (1+r)^n$. (See note A)

n (years)	Interest % (=100 <i>r</i>)									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
1	1.0100	1.0150	1.0200	1.0250	1.0300	1.0350	1.0400	1.0450	1.0500	1.0550
2	1.0201	1.0302	1.0404	1.0506	1.0609	1.0712	1.0816	1.0920	1.1025	1.1130
3	1.0303	1.0457	1.0612	1.0769	1.0927	1.1087	1.1249	1.1412	1.1576	1.1742
4	1.0406	1.0614	1.0824	1.1038	1.1255	1.1475	1.1699	1.1925	1.2155	1.2388
5	1.0510	1.0773	1.1041	1.1314	1.1593	1.1877	1.2167	1.2462	1.2763	1.3070
6	1.0615	1.0934	1.1262	1.1597	1.1941	1.2293	1.2653	1.3023	1.3401	1.3788
7	1.0721	1.1098	1.1487	1.1887	1.2299	1.2723	1.3159	1.3609	1.4071	1.4547
8	1.0829	1.1265	1.1717	1.2184	1.2668	1.3168	1.3686	1.4221	1.4775	1.5347
9	1.0937	1.1434	1.1951	1.2489	1.3048	1.3629	1.4233	1.4861	1.5513	1.6191
10	1.1046	1.1605	1.2190	1.2801	1.3439	1.4106	1.4802	1.5530	1.6289	1.7081
11	1.1157	1.1779	1.2434	1.3121	1.3842	1.4600	1.5395	1.6229	1.7103	1.8012
12	1.1268	1.1956	1.2682	1.3449	1.4258	1.5111	1.6010	1.6959	1.7959	1.9012
13	1.1381	1.2136	1.2936	1.3785	1.4685	1.5640	1.6651	1.7722	1.8856	2.0058
14	1.1495	1.2318	1.3195	1.4130	1.5126	1.6187	1.7317	1.8519	1.9799	2.1161
15	1.1610	1.2502	1.3459	1.4483	1.5580	1.6753	1.8009	1.9353	2.0789	2.2325
16	1.1726	1.2690	1.3728	1.4845	1.6047	1.7340	1.8730	2.0224	2.1829	2.3553
17	1.1843	1.2880	1.4002	1.5216	1.6528	1.7947	1.9479	2.1134	2.2920	2.4848
18	1.1961	1.3073	1.4282	1.5597	1.7024	1.8575	2.0258	2.2085	2.4066	2.6155
19	1.2081	1.3270	1.4568	1.5986	1.7535	1.9225	2.1068	2.3079	2.5269	2.7656
20	1.2202	1.3469	1.4859	1.6386	1.8061	1.9898	2.1911	2.4117	2.6533	2.9178
25	1.2824	1.4509	1.6406	1.8539	2.0938	2.3632	2.6658	3.0054	3.3864	3.8134
30	1.3478	1.5631	1.8114	2.0976	2.4273	2.8068	3.2434	3.7453	4.3219	4.9840
35	1.4166	1.6839	1.9999	2.3732	2.8139	3.3336	3.9461	4.6673	5.5160	6.5138
40	1.4889	1.8140	2.2080	2.6851	3.2620	3.9593	4.8010	5.8164	7.0400	8.5133
45	1.5648	1.9542	2.4379	3.0379	3.7816	4.7024	5.8412	7.2482	8.9850	11.127
50	1.6446	2.1052	2.6916	3.4371	4.3839	5.5849	7.1067	9.0326	11.467	14.542
55	1.7286	2.2679	2.9717	3.8888	5.0821	6.6331	8.6464	11.256	14.636	19.006
60	1.8167	2.4432	3.2810	4.3998	5.8916	7.8781	10.519	14.027	18.679	24.840

n (years)	Interest % (=100 <i>r</i>)									
	6.0	6.5	7.0	7.5	8.0	9.0	10.0	12.0	15.0	20.0
1	1.0600	1.0650	1.0700	1.0750	1.0800	1.0900	1.1000	1.1200	1.1500	1.2000
2	1.1236	1.1342	1.1449	1.1556	1.1664	1.1881	1.2100	1.2544	1.3225	1.4400
3	1.1910	1.2079	1.2250	1.2423	1.2597	1.2950	1.3310	1.4049	1.5209	1.7280
4	1.2625	1.2865	1.3108	1.3355	1.3605	1.4116	1.4641	1.5735	1.7490	2.0736
5	1.3382	1.3701	1.4026	1.4356	1.4693	1.5386	1.6105	1.7623	2.0114	2.4883
6	1.4185	1.4591	1.5007	1.5433	1.5869	1.6771	1.7716	1.9738	2.3131	2.9860
7	1.5036	1.5540	1.6058	1.6590	1.7138	1.8280	1.9487	2.2107	2.6600	3.5832
8	1.5938	1.6550	1.7182	1.7835	1.8509	1.9926	2.1436	2.4760	3.0590	4.2998
9	1.6895	1.7626	1.8385	1.9172	1.9990	2.1719	2.3579	2.7731	3.5179	5.1598
10	1.7908	1.8771	1.9672	2.0610	2.1589	2.3674	2.5937	3.1058	4.0456	6.1917
11	1.8983	1.9992	2.1049	2.2156	2.3316	2.5804	2.8531	3.4785	4.6524	7.4301
12	2.0122	2.1291	2.2522	2.3818	2.5182	2.8127	3.1384	3.8960	5.3502	8.9161
13	2.1329	2.2675	2.4098	2.5604	2.7196	3.0658	3.4523	4.3635	6.1528	10.699
14	2.2609	2.4149	2.5785	2.7524	2.9372	3.3417	3.7975	4.8871	7.0757	12.839
15	2.3966	2.5718	2.7590	2.9589	3.1722	3.6425	4.1772	5.4736	8.1371	15.407
16	2.5404	2.7390	2.9522	3.1808	3.4259	3.9703	4.5950	6.1304	9.3576	18.488
17	2.6928	2.9170	3.1588	3.4194	3.7000	4.3276	5.0545	6.8660	10.761	22.186
18	2.8543	3.1067	3.3799	3.6758	3.9960	4.7171	5.5599	7.6900	12.375	26.623
19	3.0256	3.3086	3.6165	3.9515	4.3157	5.1417	6.1159	8.6128	14.232	31.948
20	3.2071	3.5236	3.8697	4.2479	4.6610	5.6044	6.7275	9.6463	16.367	38.338
25	4.2919	4.8277	5.4274	6.0983	6.8485	8.6231	10.835	17.000	32.919	95.396
30	5.7435	6.6144	7.6123	8.7550	10.063	13.268	17.449	29.960	66.212	237.38
35	7.6861	9.0623	10.677	12.569	14.785	20.414	28.102	52.800	133.18	590.67
40	10.286	12.416	14.974	18.044	21.725	31.409	45.259	93.051	267.86	1469.8
45	13.765	17.011	21.002	25.905	31.920	48.327	72.890	163.99	538.77	3657.3
50	18.420	23.307	29.457	37.190	46.902	74.358	117.39	289.00	1083.7	9100.4
55	24.650	31.932	41.315	53.391	68.914	114.41	189.06	509.32	2179.7	22644
60	32.988	43.750	57.946	76.649	101.26	176.03	304.50	897.59	4384.1	56346

TABLE 2. PRESENT VALUE OF A SINGLE SUM

The present value of £1 n years hence, when discounted at interest rate r per annum = $(1+r)^{-n}$. (See note B)

n (years)	Interest % (=100 r)									
	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5
1	0.99010	0.98522	0.98039	0.97561	0.97087	0.96618	0.96154	0.95694	0.95238	0.94787
2	0.98030	0.97066	0.96117	0.95181	0.94260	0.93351	0.92456	0.91573	0.90703	0.89845
3	0.97059	0.95632	0.94232	0.92860	0.91514	0.90194	0.88900	0.87630	0.86384	0.85161
4	0.96098	0.94218	0.92385	0.90595	0.88849	0.87144	0.85480	0.83856	0.82270	0.80722
5	0.95147	0.92826	0.90573	0.88385	0.86261	0.84197	0.82193	0.80245	0.78353	0.76513
6	0.94205	0.91454	0.88797	0.86230	0.83748	0.81350	0.79031	0.76790	0.74622	0.72525
7	0.93272	0.90103	0.87056	0.84127	0.81309	0.78599	0.75992	0.73483	0.71068	0.68744
8	0.92348	0.88771	0.85349	0.82075	0.78941	0.75941	0.73069	0.70319	0.67684	0.65160
9	0.91434	0.87459	0.83676	0.80073	0.76642	0.73373	0.70259	0.67290	0.64461	0.61763
10	0.90529	0.86167	0.82035	0.78120	0.74409	0.70892	0.67556	0.64393	0.61391	0.58543
11	0.89632	0.84893	0.80426	0.76214	0.72242	0.68495	0.64958	0.61620	0.58468	0.55491
12	0.88745	0.83639	0.78849	0.74356	0.70138	0.66178	0.62460	0.58966	0.55684	0.52598
13	0.87866	0.82403	0.77303	0.72542	0.68095	0.63940	0.60057	0.56427	0.53032	0.49856
14	0.86996	0.81185	0.75788	0.70773	0.66112	0.61778	0.57748	0.53997	0.50507	0.47257
15	0.86135	0.79985	0.74301	0.69047	0.64186	0.59689	0.55526	0.51672	0.48102	0.44793
16	0.85282	0.78803	0.72845	0.67363	0.62317	0.57671	0.53391	0.49447	0.45811	0.42458
17	0.84438	0.77637	0.71416	0.65720	0.60502	0.55720	0.51337	0.47318	0.43630	0.40245
18	0.83602	0.76491	0.70016	0.64117	0.58739	0.53836	0.49363	0.45280	0.41552	0.38147
19	0.82774	0.75361	0.68643	0.62553	0.57029	0.52016	0.47464	0.43330	0.39573	0.36158
20	0.81954	0.74247	0.67297	0.61027	0.55368	0.50257	0.45639	0.41464	0.37689	0.34273
25	0.77977	0.68921	0.60953	0.53939	0.47761	0.42315	0.37512	0.33273	0.29530	0.26223
30	0.74192	0.63976	0.55207	0.47674	0.41199	0.35628	0.30832	0.26700	0.23138	0.20064
35	0.70591	0.59387	0.50003	0.42137	0.35538	0.29998	0.25342	0.21425	0.18129	0.15352
40	0.67165	0.55126	0.45289	0.37243	0.30656	0.25257	0.20829	0.17193	0.14205	0.11746
45	0.63905	0.51171	0.41020	0.32917	0.26444	0.21266	0.17120	0.13796	0.11130	0.08988
50	0.60804	0.47500	0.37153	0.29094	0.22811	0.17905	0.14071	0.11071	0.08720	0.06877
55	0.57853	0.44093	0.33650	0.25715	0.19677	0.15076	0.11566	0.08884	0.06833	0.05262
60	0.55045	0.40930	0.30478	0.22728	0.16973	0.12693	0.09506	0.07129	0.05354	0.04026

n (years)	Interest % (=100 r)									
	6	6.5	7	7.5	8	9	10	12	15	20
1	0.94340	0.93897	0.93458	0.93023	0.92593	0.92174	0.90909	0.89286	0.86957	0.83333
2	0.89000	0.88166	0.87344	0.86533	0.85734	0.84168	0.82645	0.79719	0.75614	0.69444
3	0.83962	0.82785	0.81630	0.80496	0.79383	0.77218	0.75131	0.71178	0.65752	0.57870
4	0.79209	0.77732	0.76290	0.74480	0.73503	0.70843	0.68301	0.63552	0.57175	0.48225
5	0.74726	0.72988	0.71299	0.69656	0.68058	0.64993	0.62092	0.56743	0.49718	0.40188
6	0.70496	0.68533	0.66634	0.64796	0.63017	0.59627	0.56447	0.50663	0.43233	0.33490
7	0.66506	0.64351	0.62275	0.60275	0.58349	0.54703	0.51316	0.45235	0.37594	0.27908
8	0.62741	0.60423	0.58201	0.56070	0.54027	0.50187	0.46651	0.40388	0.32690	0.23257
9	0.59190	0.56735	0.54393	0.52158	0.50025	0.46043	0.42410	0.36061	0.28426	0.19381
10	0.55839	0.53273	0.50835	0.48519	0.46319	0.42241	0.38554	0.32197	0.24718	0.16151
11	0.52679	0.50021	0.47509	0.45134	0.42888	0.38753	0.35049	0.28748	0.21494	0.13459
12	0.49697	0.46968	0.44401	0.41985	0.39711	0.35553	0.31863	0.25668	0.18691	0.11216
13	0.46884	0.44102	0.41496	0.39056	0.36770	0.32618	0.28966	0.22917	0.16253	0.09346
14	0.44230	0.41410	0.38782	0.36331	0.34046	0.29925	0.26333	0.20462	0.14133	0.07789
15	0.41727	0.38883	0.36245	0.33797	0.31524	0.27454	0.23939	0.18270	0.12289	0.06491
16	0.39365	0.36510	0.33873	0.31439	0.29189	0.25187	0.21763	0.16312	0.10686	0.05409
17	0.37136	0.34281	0.31657	0.29245	0.27027	0.23107	0.19784	0.14564	0.09293	0.04507
18	0.35034	0.32189	0.29586	0.27205	0.25025	0.21199	0.17986	0.13004	0.08081	0.03756
19	0.33051	0.30224	0.27651	0.25307	0.23171	0.19449	0.16351	0.11611	0.07027	0.03130
20	0.31180	0.28380	0.25842	0.23541	0.21455	0.17843	0.14864	0.10367	0.06110	0.02608
25	0.23300	0.20714	0.18425	0.16398	0.14602	0.11597	0.09230	0.05882	0.03038	0.01048
30	0.17411	0.15119	0.13137	0.11422	0.09938	0.07537	0.05731	0.03338	0.01510	0.00421
35	0.13011	0.11035	0.09366	0.07956	0.06763	0.04899	0.03558	0.01894	0.00751	0.00169
40	0.09722	0.08054	0.06678	0.05542	0.04603	0.03184	0.02209	0.01075	0.00373	0.00068
45	0.07265	0.05879	0.04761	0.03860	0.03133	0.02069	0.01372	0.00610	0.00186	0.00027
50	0.05429	0.04291	0.03395	0.02689	0.02132	0.01345	0.00852	0.00346	0.00092	0.00011
55	0.04057	0.03132	0.02420	0.01873	0.01451	0.00874	0.00529	0.00196	0.00044	0.00004
60	0.03031	0.02286	0.01726	0.01305	0.00988	0.00568	0.00328	0.00111	0.00023	0.00002

TABLE 3. PRESENT VALUE OF AN ANNUITY

The present value of £1 per annum for n years when discounted at interest rate r per annum $=\frac{1-(1+r)^{-n}}{r}$. (See note C)
 The amount per annum to redeem a loan of £1 at the end of n years and provide interest on the outstanding balance at r per annum can be determined from the reciprocals of values in this table. (See note D)

Interest % (=100*r*)

n (years)	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5
1	0.9901	0.9852	0.9804	0.9756	0.9709	0.9662	0.9615	0.9569	0.9524	0.9479
2	1.9704	1.9559	1.9416	1.9274	1.9135	1.8997	1.8861	1.8727	1.8594	1.8463
3	2.9410	2.9122	2.8839	2.8560	2.8286	2.8016	2.7751	2.7490	2.7232	2.6979
4	3.9020	3.8544	3.8077	3.7620	3.7171	3.6731	3.6299	3.5875	3.5460	3.5052
5	4.8534	4.7826	4.7135	4.6458	4.5797	4.5151	4.4518	4.3900	4.3295	4.2703
6	5.7955	5.6972	5.6014	5.5081	5.4172	5.3286	5.2421	5.1579	5.0757	4.9955
7	6.7282	6.5982	6.4720	6.3494	6.2303	6.1145	6.0021	5.8927	5.7864	5.6830
8	7.6517	7.4859	7.3255	7.1701	7.0197	6.8740	6.7327	6.5959	6.4632	6.3346
9	8.5660	8.3605	8.1622	7.9709	7.7861	7.6077	7.4353	7.2688	7.1078	6.9522
10	9.4713	9.2222	8.9826	8.7521	8.5302	8.3166	8.1109	7.9127	7.7217	7.5376
11	10.3676	10.0711	9.7868	9.5142	9.2526	9.0015	8.7605	8.5289	8.3064	8.0925
12	11.2551	10.9075	10.5753	10.2578	9.9540	9.6633	9.3851	9.1186	8.8633	8.6185
13	12.1337	11.7315	11.3484	10.9832	10.6350	10.3027	9.9856	9.6829	9.3936	9.1171
14	13.0037	12.5434	12.1062	11.6909	11.2961	10.9205	10.5631	10.2228	9.8986	9.5896
15	13.8650	13.3432	12.8493	12.3814	11.9379	11.5174	11.1184	10.7395	10.3797	10.0376
16	14.7179	14.1313	13.5777	13.0550	12.5611	12.0941	11.6523	11.2340	10.8378	10.4622
17	15.5622	14.9076	14.2919	13.7122	13.1661	12.6513	12.1657	11.7072	11.2741	10.8646
18	16.3983	15.6725	14.9920	14.3534	13.7535	13.1897	12.6593	12.1600	11.6896	11.2461
19	17.2260	16.4262	15.6785	14.9789	14.3238	13.7098	13.1339	12.5933	12.0853	11.6077
20	18.0455	17.1686	16.3514	15.5892	14.8775	14.2124	13.5903	13.0079	12.4622	11.9504
25	22.0231	20.7196	19.5234	18.4244	17.4131	16.4815	15.6221	14.8282	14.0939	13.4139
30	25.8077	24.0158	22.3964	20.9303	19.6004	18.3920	17.2920	16.2889	15.3725	14.5337
35	29.4086	27.0756	24.9986	23.1452	21.4872	20.0007	18.6646	17.4610	16.3742	15.3906
40	32.8347	29.9158	27.3555	25.1028	23.1148	21.3551	19.7928	18.4016	17.1591	16.0461
45	36.0945	32.5523	29.4902	26.8330	24.5187	22.4954	20.7200	19.1563	17.7741	16.5477
50	39.1961	34.9997	31.4236	28.3623	25.7298	23.4556	21.4822	19.7620	18.2559	16.9315
55	42.1472	37.2715	33.1748	29.7140	26.7744	24.2641	22.1086	20.2480	18.6335	17.2252
60	44.9550	39.3803	34.7609	30.9087	27.6756	24.9447	22.6235	20.6380	18.9293	17.4500

Interest % (=100*r*)

n (years)	6	6.5	7	7.5	8	9	10	12	15	20
1	0.9434	0.9390	0.9346	0.9302	0.9259	0.9174	0.9091	0.8929	0.8696	0.8333
2	1.8334	1.8206	1.8080	1.7956	1.7833	1.7591	1.7355	1.6901	1.6257	1.5278
3	2.6730	2.6485	2.6243	2.6005	2.5771	2.5313	2.4869	2.4018	2.2832	2.1065
4	3.4651	3.4258	3.3872	3.3493	3.3121	3.2397	3.1699	3.0373	2.8550	2.5887
5	4.2124	4.1557	4.1002	4.0459	3.9927	3.8897	3.7908	3.6048	3.3522	2.9906
6	4.9173	4.8410	4.7665	4.6938	4.6229	4.4859	4.3553	4.1114	3.7845	3.3255
7	5.5824	5.4845	5.3893	5.2966	5.2064	5.0330	4.8684	4.5638	4.1604	3.6046
8	6.2098	6.0888	5.9713	5.8573	5.7466	5.5348	5.3349	4.9676	4.4873	3.8372
9	6.8017	6.6561	6.5152	6.3789	6.2469	5.9952	5.7590	5.3282	4.7716	4.0310
10	7.3601	7.1888	7.0236	6.8641	6.7101	6.4177	6.1446	5.6502	5.0188	4.1925
11	7.8869	7.6890	7.4987	7.3154	7.1390	6.8052	6.4951	5.9377	5.2337	4.3271
12	8.3838	8.1587	7.9427	7.7353	7.5361	7.1607	6.8137	6.1944	5.4206	4.4392
13	8.8527	8.5997	8.3577	8.1258	7.9038	7.4869	7.1034	6.4235	5.5831	4.5327
14	9.2950	9.0138	8.7455	8.4892	8.2442	7.7862	7.3667	6.6282	5.7245	4.6106
15	9.7122	9.4027	9.1079	8.8271	8.5595	8.0607	7.6061	6.8109	5.8474	4.6755
16	10.1059	9.7678	9.4466	9.1415	8.8514	8.3126	7.8237	6.9740	5.9542	4.7296
17	10.4773	10.1106	9.7632	9.4340	9.1216	8.5436	8.0216	7.1196	6.0472	4.7746
18	10.8276	10.4325	10.0591	9.7060	9.3719	8.7556	8.2014	7.2497	6.1280	4.8122
19	11.1581	10.7347	10.3356	9.9591	9.6036	8.9501	8.3649	7.3658	6.1982	4.8435
20	11.4699	11.0185	10.5940	10.1945	9.8181	9.1285	8.5136	7.4694	6.2593	4.8696
25	12.7834	12.1979	11.6536	11.1469	10.6748	9.8226	9.0770	7.8431	6.4641	4.9476
30	13.7648	13.0587	12.4090	11.8104	11.2578	10.2737	9.4269	8.0552	6.5660	4.9789
35	14.4982	13.6870	12.9477	12.2725	11.6546	10.5668	9.6442	8.1755	6.6166	4.9915
40	15.0463	14.1455	13.3317	12.5944	11.9246	10.7574	9.7791	8.2438	6.6418	4.9966
45	15.4558	14.4802	13.6055	12.8186	12.1084	10.8812	9.8628	8.2825	6.6543	4.9986
50	15.7619	14.7245	13.8007	12.9748	12.2335	10.9617	9.9148	8.3045	6.6605	4.9995
55	15.9905	14.9028	13.9400	13.0836	12.3186					
60	16.1614	15.0330	14.0392	13.1594	12.3766					

COMPOUND INTEREST AND ANNUITY TABLES

TABLE 4. SINKING FUND

The amount per annum for n years at interest rate r per annum needed to accumulate to £1 = $\{r/((1+r)^n - 1)\}$. (See note E)
 The amount to which £1 per annum will increase in n years when accumulated at interest rate r per annum can be determined from the reciprocals of values in this table. (See note E)

n (years)	Interest % (=100 <i>r</i>)									
	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5
1	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
2	0.49751	0.49628	0.49505	0.49383	0.49261	0.49140	0.49020	0.48900	0.48780	0.48662
3	0.33002	0.32838	0.32675	0.32514	0.32353	0.32193	0.32035	0.31877	0.31721	0.31565
4	0.24628	0.24444	0.24262	0.24082	0.23903	0.23725	0.23549	0.23374	0.23201	0.23029
5	0.19604	0.19409	0.19216	0.19025	0.18835	0.18648	0.18463	0.18279	0.18097	0.17918
6	0.16255	0.16053	0.15853	0.15655	0.15460	0.15267	0.15076	0.14888	0.14702	0.14518
7	0.13863	0.13656	0.13451	0.13250	0.13051	0.12854	0.12661	0.12470	0.12282	0.12096
8	0.12069	0.11858	0.11651	0.11447	0.11246	0.11048	0.10853	0.10661	0.10472	0.10286
9	0.10674	0.10461	0.10252	0.10046	0.09843	0.09645	0.09449	0.09257	0.09069	0.08884
10	0.09558	0.09343	0.09133	0.08926	0.08723	0.08524	0.08329	0.08138	0.07950	0.07767
11	0.08645	0.08429	0.08218	0.08011	0.07808	0.07609	0.07415	0.07225	0.07039	0.06857
12	0.07885	0.07668	0.07456	0.07249	0.07046	0.06848	0.06655	0.06467	0.06283	0.06103
13	0.07241	0.07024	0.06812	0.06605	0.06403	0.06206	0.06014	0.05828	0.05646	0.05468
14	0.06690	0.06472	0.06260	0.06054	0.05853	0.05657	0.05467	0.05282	0.05102	0.04928
15	0.06212	0.05994	0.05783	0.05577	0.05377	0.05183	0.04994	0.04811	0.04634	0.04463
16	0.05794	0.05577	0.05365	0.05160	0.04961	0.04768	0.04582	0.04402	0.04227	0.04058
17	0.05426	0.05208	0.04997	0.04793	0.04595	0.04404	0.04220	0.04042	0.03870	0.03704
18	0.05098	0.04881	0.04670	0.04467	0.04271	0.04082	0.03899	0.03724	0.03555	0.03392
19	0.04805	0.04588	0.04378	0.04176	0.03981	0.03794	0.03614	0.03441	0.03275	0.03115
20	0.04542	0.04325	0.04116	0.03915	0.03722	0.03536	0.03358	0.03188	0.03024	0.02868
25	0.03541	0.03326	0.03122	0.02928	0.02743	0.02567	0.02401	0.02244	0.02095	0.01955
30	0.02875	0.02664	0.02465	0.02278	0.02102	0.01937	0.01783	0.01639	0.01505	0.01381
35	0.02400	0.02193	0.02000	0.01821	0.01654	0.01500	0.01358	0.01227	0.01107	0.00997
40	0.02046	0.01843	0.01656	0.01484	0.01326	0.01183	0.01052	0.00934	0.00828	0.00732
45	0.01771	0.01572	0.01391	0.01227	0.01079	0.00945	0.00826	0.00720	0.00626	0.00543
50	0.01551	0.01357	0.01182	0.01026	0.00887	0.00763	0.00655	0.00560	0.00478	0.00406
55	0.01373	0.01183	0.01014	0.00865	0.00735	0.00621	0.00523	0.00439	0.00367	0.00305
60	0.01224	0.01039	0.00877	0.00735	0.00613	0.00509	0.00420	0.00345	0.00283	0.00231

n (years)	Interest % (=100 <i>r</i>)									
	6	6.5	7	7.5	8	9	10	12	15	20
1	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
2	0.48544	0.48426	0.48309	0.48193	0.48077	0.47847	0.47619	0.47170	0.46512	0.45455
3	0.31411	0.31258	0.31105	0.30954	0.30803	0.30505	0.30211	0.29635	0.28798	0.27473
4	0.22859	0.22690	0.22523	0.22357	0.22192	0.21867	0.21547	0.20923	0.20027	0.18629
5	0.17740	0.17563	0.17389	0.17216	0.17046	0.16709	0.16380	0.15741	0.14832	0.13438
6	0.14336	0.14157	0.13980	0.13804	0.13632	0.13292	0.12961	0.12323	0.11424	0.10071
7	0.11914	0.11733	0.11555	0.11380	0.11207	0.10869	0.10541	0.09912	0.09036	0.07742
8	0.10104	0.09924	0.09747	0.09573	0.09401	0.09067	0.08744	0.08130	0.07285	0.06061
9	0.08702	0.08524	0.08349	0.08177	0.08008	0.07680	0.07364	0.06768	0.05957	0.04808
10	0.07587	0.07410	0.07238	0.07069	0.06903	0.06582	0.06275	0.05698	0.04925	0.03852
11	0.06679	0.06506	0.06336	0.06170	0.06008	0.05695	0.05396	0.04842	0.04107	0.03110
12	0.05928	0.05757	0.05590	0.05428	0.05270	0.04965	0.04676	0.04144	0.03448	0.02526
13	0.05296	0.05128	0.04965	0.04806	0.04652	0.04357	0.04078	0.03568	0.02911	0.02062
14	0.04758	0.04594	0.04434	0.04280	0.04130	0.03843	0.03575	0.03087	0.02469	0.01689
15	0.04296	0.04135	0.03979	0.03829	0.03683	0.03406	0.03147	0.02682	0.02102	0.01388
16	0.03895	0.03738	0.03586	0.03439	0.03298	0.03030	0.02782	0.02339	0.01795	0.01144
17	0.03544	0.03391	0.03243	0.03100	0.02963	0.02705	0.02466	0.02046	0.01537	0.00944
18	0.03236	0.03085	0.02941	0.02803	0.02670	0.02421	0.02193	0.01794	0.01319	0.00781
19	0.02962	0.02816	0.02675	0.02541	0.02413	0.02173	0.01955	0.01576	0.01134	0.00646
20	0.02718	0.02576	0.02439	0.02309	0.02185	0.01955	0.01746	0.01388	0.00976	0.00536
25	0.01823	0.01698	0.01581	0.01471	0.01368	0.01181	0.01017	0.00750	0.00470	0.00212
30	0.01265	0.01158	0.01059	0.00967	0.00883	0.00734	0.00608	0.00414	0.00230	8.46 -4*
35	0.00897	0.00806	0.00723	0.00648	0.00580	0.00464	0.00369	0.00232	0.00113	3.39 -4*
40	0.00646	0.00569	0.00501	0.00440	0.00386	0.00296	0.00226	0.00130	5.62 -4*	1.36 -4*
45	0.00470	0.00406	0.00350	0.00301	0.00259	0.00190	0.00139	7.36 -4*	2.79 -4*	5.47 -5*
50	0.00344	0.00291	0.00246	0.00207	0.00174	0.00123	8.59 -4*	4.17 -4*	1.39 -4*	2.20 -5*
55	0.00253	0.00210	0.00174	0.00143	0.00118					
60	0.00187	0.00152	0.00123	0.00090	0.00080					

* The figures -4 or -5 indicate that the figures preceding them should be multiplied by 10⁻⁴ or 10⁻⁵.