INDIAN INSTITUE OF TECHNOLOGY, KHARAGPUR

MID-TERM EXAMINATION

Session: 2012–2013   Semester: Autumn

Subject: Engineering Economy, Costing, and Accounting (IM 21001)

Full Marks: 30   Time: Two hours

Answer all questions. They carry equal marks.
Use the Attached Interest Table for 10 % per Year

Question 1

a. . What are the considerations for selecting a value of the minimum attractive rate of return?
b. What are the merits and demerits of the internal rate of return method as a method of evaluating economic alternatives?
c. How is the economic life of a challenging asset estimated in the replacement analysis?
d. Where is the benefit-cost ratio used and why?

Question 2

There is a continuing requirement for standby electrical power at a public utility service facility. Equipment alternative S1 involves an initial cost of Rs. 720,000, a 9-year useful life, annual expenses of Rs. 22,000 in the first year and increasing by Rs.3,000 per year thereafter, and a net market value of Rs. 84,000 at the end of the useful life. Alternative S2 has an initial cost of Rs. 900,000, a 12-year useful life, annual expenses of Rs. 21,000 the first year and increasing by Rs. 2,000 per year thereafter, and a net market value of Rs. 130,000 at the end of the useful life. The current interest rate is 10 % per year. Which alternative is preferred using the capitalized worth method of analysis?

Question 3

A centerless grinder can be bought new for Rs. 180,000. It will have an eight-year useful life and no terminal market value. Reduction in operating expenses (savings) from the machine will be Rs. 80,000 in each of the first four years and Rs. 30,000 in each of the last four years. Depreciation will be by the double-declining balance method with switchover to straight-line method. A used grinder can be bought for Rs. 80,000 and will have no scrap value after eight years. It will save an amount of Rs. 30,000 per year over the eight-year period and will be depreciated Rs.10,000 per year. The effective income tax is 40 %. Determine the PW of the incremental after-tax cash flow. Which alternative is preferred? The after-tax MARR is 10 %.

TABLE C-13 Discrete Compounding; $i = 10\%$

| | Single Payment | | Uniform Series | | | | Uniform Gradient | | |
| | Compound Amount Factor | Present Worth Factor | Compound Amount Factor | Presen. Worth Factor | Sinking Fund Factor | Capital Recovery Factor | Gradient Present Worth Factor | Gradient Uniform Series Factor | |
N	To Find F Given P F/P	To Find P Given F P/F	To Find F Given A F/A	To Find P Given A P/A	To Find A Given F A/F	To Find A Given P A/P	To Find P Given G P/G	To Find A Given G A/G	N
1	1.1000	0.9091	1.0000	0.9091	1.0000	1.1000	0.000	0.0000	1
2	1.2100	0.8264	2.1000	1.7355	0.4762	0.5762	0.826	0.4762	2
3	1.3310	0.7513	3.3100	2.4869	0.3021	0.4021	2.329	0.9366	3
4	1.4641	0.6830	4.6410	3.1699	0.2155	0.3155	4.378	1.3812	4
5	1.6105	0.6209	6.1051	3.7908	0.1638	0.2638	6.862	1.8101	5
6	1.7716	0.5645	7.7156	4.3553	0.1296	0.2296	9.684	2.2236	6
7	1.9487	0.5132	9.4872	4.8684	0.1054	0.2054	12.763	2.6216	7
8	2.1436	0.4665	11.4359	5.3349	0.0874	0.1874	16.029	3.0045	8
9	2.3579	0.4241	13.5795	5.7590	0.0736	0.1736	19.422	3.3724	9
10	2.5937	0.3855	15.9374	6.1446	0.0627	0.1627	22.891	3.7255	10
11	2.8531	0.3505	18.5312	6.4951	0.0540	0.1540	26.396	4.0641	11
12	3.1384	0.3186	21.3843	6.8137	0.0468	0.1468	29.901	4.3884	12
13	3.4523	0.2897	24.5227	7.1034	0.0408	0.1408	33.377	4.6988	13
14	3.7975	0.2633	27.9750	7.3667	0.0357	0.1357	36.801	4.9955	14
15	4.1772	0.2394	31.7725	7.6061	0.0315	0.1315	40.152	5.2789	15
16	4.5950	0.2176	35.9497	7.8237	0.0278	0.1278	43.416	5.5493	16
17	5.0545	0.1978	40.5447	8.0216	0.0247	0.124~	46.582	5.8071	17
18	5.5599	0.1799	45.5992	8.2014	0.0219	0.1219	49.640	6.0526	18
19	6.1159	0.1635	51.1591	8.3649	0.0195	0.1195	52.583	6.2861	19
20	6.7275	0.1486	57.2750	8.5136	0.0175	0.1175	55.407	6.5081	20
21	7.4002	0.1351	64.0025	8.6487	0.0156	0.1156	58.110	6.7189	21
22	8.1403	0.1228	71.4027	8.7715	0.0140	0.1140	60.689	6.9189	22
23	8.9543	0.1117	79.5430	8.8832	0.0126	0.1126	63.146	7.1085	23
24	9.8497	0.1015	88.4973	8.9847	0.0113	0.1113	65.481	7.2881	24
25	10.8347	0.0923	98.3471	9.0770	0.0102	0.1102	67.696	7.4580	25
30	17.4494	0.0573	164.4940	9.4269	0.0061	0.1061	77.077	8.1762	30
35	28.1024	0.0356	271.0244	9.6442	0.0037	0.1037	83.987	8.7086	35
40	45.2593	0.0221	442.5926	9.7791	0.0023	0.1023	88.953	9.0962	40
45	72.8905	0.0137	718.9048	9.8628	0.0014	0.1014	92.454	9.3740	45
50	117.3909	0.0085	1163.9085	9.9148	0.0009	0.1009	94.889	9.5704	50
60	304.4816	0.0033	3034.8164	9.9672	0.0003	0.1003	97.701	9.8023	60
80	2048.4002	0.0005	20474.0021	9.9951	*	0.1000	99.561	9.9609	80
100	13780.6123	0.0001	137796.1234	9.9993	*	0.1000	99.920	9.9927	100
∞				10.0000		0.1000			∞

* Less than 0.0001.