Question Paper

Exam Date & Time: 04-Jan-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B.TECH. EXAMINATIONS - JANUARY 2024
SUBJECT: HUM 3051/HUM-3051- ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Interest factor table are provided, for others use formulae
Missing data may be suitably assumed.

1A) Globex Industries Inc. is considering establishing a new machine to automate a digital printing process. The machine will save $50,000 in labor annually. The machine can be purchased for $200,000 today and will be used for 10 years. It has a salvage value of $10,000 at the end of its useful life. The new machine will require an annual maintenance cost of $9000. The corporation has a minimum rate of return of 10%. Do you recommend automating the process? Use PW method. (3)

10% Compound Interest Factors

	Single Payment		Uniform Payment Series				Arithmetic Gradient	
n	Compound Amount Factor Find F Given P F/P	Present Worth Factor Find P Given F P/F	Sinking Fund Factor Find A Given F A/F	Capital Recovery Factor Find A Given P A/P	Compound Amount Factor Find F Given A F/A	Present Worth Factor Find P Given A P/A	Gradient Uniform Series Find A Given G A/G	Gradient Present Worth Find P Given G P/G
1	1.100	.9091	1.0000	1.1000	1.000	0.909	0	0
2	1.210	.8264	.4762	.5762	2.100	1.736	0.476	0.826
3	1.331	.7513	.3021	.4021	3.310	2.487	0.937	2.329
4	1.464	.6830	.2155	.3155	4.641	3.170	1.381	4.378
5	1.611	.6209	.1638	.2638	6.105	3.791	1.810	6.862
6	1.772	.5645	.1296	.2296	7.716	4.355	2.224	9.684
7	1.949	.5132	.1054	.2054	9.487	4.868	2.622	12.763
8	2.144	.4665	.0874	.1874	11.436	5.335	3.004	16.029
9	2.358	.4241	.0736	.1736	13.579	5.759	3.372	19.421
10	2.594	.3855	.0627	.1627	15.937	6.145	3.725	22.891

1B) If the investment plan has a withdrawal of Rs. 10,000 in the tenth year from now and then onwards the withdrawal increases by an amount of Rs. 2500 semi-annually for the next five years. For these withdrawals, an equal amount will be invested every quarter from year 1 to 9. Find this amount if the investment has interest rate is 20% compounded semi-annually. (3)

10% — Compound Interest Factors

n	Single Payment: Compound Amount Factor Find F Given P F/P	Single Payment: Present Worth Factor Find P Given F P/F	Uniform Payment Series: Sinking Fund Factor Find A Given F A/F	Uniform Payment Series: Capital Recovery Factor Find A Given P A/P	Uniform Payment Series: Compound Amount Factor Find F Given A F/A	Uniform Payment Series: Present Worth Factor Find P Given A P/A	Arithmetic Gradient: Gradient Uniform Series Find A Given G A/G	Arithmetic Gradient: Gradient Present Worth Find P Given G P/G
1	1.100	.9091	1.0000	1.1000	1.000	0.909	0	0
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10	2.594	.3855	.0627	.1627	15.937	6.145	3.725	22.891
11	2.853	.3505	.0540	.1540	18.531	6.495	4.064	26.396
12	3.138	.3186	.0468	.1468	21.384	6.814	4.388	29.901
13	3.452	.2897	.0408	.1408	24.523	7.103	4.699	33.377
14	3.797	.2633	.0357	.1357	27.975	7.367	4.996	36.801
15	4.177	.2394	.0315	.1315	31.772	7.606	5.279	40.152
16	4.595	.2176	.0278	.1278	35.950	7.824	5.549	43.416
17	5.054	.1978	.0247	.1247	40.545	8.022	5.807	46.582
18	5.560	.1799	.0219	.1219	45.599	8.201	6.053	49.640
19	6.116	.1635	.0195	.1195	51.159	8.365	6.286	52.583
20	6.728	.1486	.0175	.1175	57.275	8.514	6.508	55.407
21	7.400	.1351	.0156	.1156	64.003	8.649	6.719	58.110
22	8.140	.1228	.0140	.1140	71.403	8.772	6.919	60.689
23	8.954	.1117	.0126	.1126	79.543	8.883	7.108	63.146
24	9.850	.1015	.0113	.1113	88.497	8.985	7.288	65.481
25	10.835	.0923	.0102	.1102	98.347	9.077	7.458	67.696
26	11.918	.0839	.00916	.1092	109.182	9.161	7.619	69.794
27	13.110	.0763	.00826	.1083	121.100	9.237	7.770	71.777
28	14.421	.0693	.00745	.1075	134.210	9.307	7.914	73.650
29	15.863	.0630	.00673	.1067	148.631	9.370	8.049	75.415
30	17.449	.0573	.00608	.1061	164.494	9.427	8.176	77.077
31	19.194	.0521	.00550	.1055	181.944	9.479	8.296	78.640
32	21.114	.0474	.00497	.1050	201.138	9.526	8.409	80.108
33	23.225	.0431	.00450	.1045	222.252	9.569	8.515	81.486
34	25.548	.0391	.00407	.1041	245.477	9.609	8.615	82.777
35	28.102	.0356	.00369	.1037	271.025	9.644	8.709	83.987

1C) Solar Energy Corp is considering two alternatives for investing in solar power systems. The company's minimum attractive rate of return is 10% per year, compounded quarterly. The details for each alternative are as follows: (4)

Alternative A: Purchase Solar Panels

Initial cost: $300,000
Annual maintenance cost: $10,000
Expected additional revenue per year: $40,000
Project lifespan: 15 years

Alternative B: Lease Solar Panels
Annual lease payment: $30,000 (payable at the beginning of each year)
Expected additional revenue per year: $45,000
Lease duration: 15 years
Evaluate the Future Worth of each alternative after 15 years and determine which option is financially more attractive for Solar Energy Corp.

2A) Ten years ago, the port of Fethiye built a new pier containing a large amount of steel work, at a cost of Rs. 30,00,000 estimating that it would have a life of 50 years. The annual maintenance cost, much of it for painting and repair caused by the environment, has turned out to be unexpectedly high, averaging Rs. 70,000/yr. The port manager has proposed to the port commission that this pier be replaced immediately with a reinforced concrete pier at an initial cost of Rs. 40,00,000. He assumes them that this pier will have a life of at least 50 years with annual maintenance costs of not over Rs. 20,000. He estimated that the net present salvage value of the existing pier would amount to Rs. 400,000. Assuming a MARR of 10%, what should the port commission's decision be? Use "Outsider's point of view" method and Annual Equivalent values. (4)

10% **Compound Interest Factors**

n	Single Payment: Compound Amount Factor Find F Given P F/P	Single Payment: Present Worth Factor Find P Given F P/F	Uniform Payment Series: Sinking Fund Factor Find A Given F A/F	Uniform Payment Series: Capital Recovery Factor Find A Given P A/P	Uniform Payment Series: Compound Amount Factor Find F Given A F/A	Uniform Payment Series: Present Worth Factor Find P Given A P/A	Arithmetic Gradient: Gradient Uniform Series Find A Given G A/G	Arithmetic Gradient: Gradient Present Worth Find P Given G P/G
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35	28.102	.0356	.00369	.1037	271.025	9.644	8.709	83.987
40	45.259	.0221	.00226	.1023	442.593	9.779	9.096	88.953
45	72.891	.0137	.00139	.1014	718.905	9.863	9.374	92.454
50	117.391	.00852	.00086	.1009	1163.9	9.915	9.570	94.889
55	189.059	.00529	.00053	.1005	1880.6	9.947	9.708	96.562
60	304.482	.00328	.00033	.1003	3034.8	9.967	9.802	97.701

2B) A bridge can be built as a part of a project, which will remain indefinitely. The construction cost is estimated at $75,000 and the maintenance costs will be $200 per year for the first five years after which it will be $500 per year. It also has an additional expense of $10,000 at the end of 3rd year. The bridge needs to be renovated once in every 10 years at a cost of $15,000. Calculate the present value of this project, if the interest rate is 10%. (3)

10% **Compound Interest Factors**

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14	3.797	.2633	.0357	.1357	27.975	7.367	4.996	36.801
15	4.177	.2394	.0315	.1315	31.772	7.606	5.279	40.152

2C) An old machine is currently valued at $4,000 and has an estimated maintenance cost of $1800 in each of the next 2 years, after which it is expected to increase by $1000 each year. The defender has no present or future salvage value. Determine the Economic service life of the defender considering i= 10%. (3)

10% Compound Interest Factors

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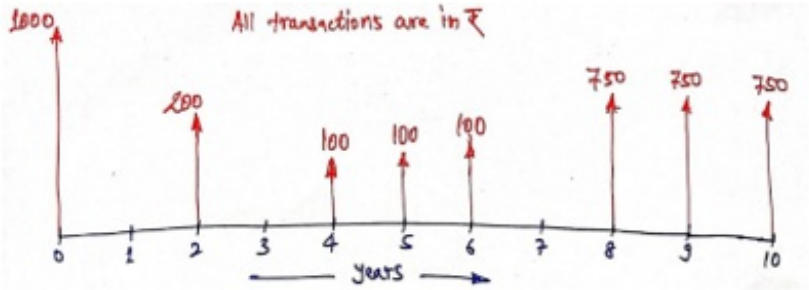
3A) L&T InfoTech has purchased 100 units of computers. The cost of each unit is Rs.1,10,000 and is expected to have a life of 4 years. After which it could be sold at Rs.25,000 each. Draw a depreciation schedule for a single unit using Straight line method. (2)

3B) The ABC company bought a tower crane 5 years ago for Rs. 15,00,000 with an estimated life of 10 years and a salvage of Rs. 60,000. Calculate the Current book value of the asset, if the company adopts Declining Balance method of depreciation. Also, calculate the depreciation charge at the end of 8th year. If the asset is sold for 5 lakhs at the end of year 8, what is the sunk loss/capital gain the company incurs? (4)

3C) A tool and die company in Pittsburgh is considering the purchase of a drill press with fuzzy-logic software to improve accuracy and reduce tool wear. The company has the opportunity to buy a slightly used machine for $15,000 or a new one for $21, 000. Because the new machine is a more sophisticated model, its operating cost is expected to be $7000 per year, while the used machine is expected to require $8200 per year. Each machine is expected to have a 25-year life with a 5% salvage value. Evaluate the best course of action using IRR method. (4)

4A) Justify the statement "Receipts or Disbursements can directly be added only if they occur at the same point in time" using the following cash flow diagram. Consider rate of interest as 12%. (5)



12.0%

N	Single Payment: Compound Amount Factor (F/P,i,N)	Single Payment: Present Worth Factor (P/F,i,N)	Equal Payment Series: Compound Amount Factor (F/A,i,N)	Equal Payment Series: Sinking Fund Factor (A/F,i,N)	Equal Payment Series: Present Worth Factor (P/A,i,N)	Equal Payment Series: Capital Recovery Factor (A/P,i,N)	Gradient Series: Gradient Uniform Series (A/G,i,N)	Gradient Series: Gradient Present Worth (P/G,i,N)	N
1	1.1200	0.8929	1.0000	1.0000	0.8929	1.1200	0.0000	0.0000	1
2	1.2544	0.7972	2.1200	0.4717	1.6901	0.5917	0.4717	0.7972	2
3	1.4049	0.7118	3.3744	0.2963	2.4018	0.4163	0.9246	2.2208	3
4	1.5735	0.6355	4.7793	0.2092	3.0373	0.3292	1.3589	4.1273	4
5	1.7623	0.5674	6.3528	0.1574	3.6048	0.2774	1.7746	6.3970	5
6	1.9738	0.5066	8.1152	0.1232	4.1114	0.2432	2.1720	8.9302	6
7	2.2107	0.4523	10.0890	0.0991	4.5638	0.2191	2.5515	11.6443	7
8	2.4760	0.4039	12.2997	0.0813	4.9676	0.2013	2.9131	14.4714	8
9	2.7731	0.3606	14.7757	0.0677	5.3282	0.1877	3.2574	17.3563	9
10	3.1058	0.3220	17.5487	0.0570	5.6502	0.1770	3.5847	20.2541	10
11	3.4785	0.2875	20.6546	0.0484	5.9377	0.1684	3.8953	23.1288	11
12	3.8960	0.2567	24.1331	0.0414	6.1944	0.1614	4.1897	25.9523	12
13	4.3635	0.2292	28.0291	0.0357	6.4235	0.1557	4.4683	28.7024	13
14	4.8871	0.2046	32.3926	0.0309	6.6282	0.1509	4.7317	31.3624	14
15	5.4736	0.1827	37.2797	0.0268	6.8109	0.1468	4.9803	33.9202	15
16	6.1304	0.1631	42.7533	0.0234	6.9740	0.1434	5.2147	36.3670	16
17	6.8660	0.1456	48.8837	0.0205	7.1196	0.1405	5.4353	38.6973	17
18	7.6900	0.1300	55.7497	0.0179	7.2497	0.1379	5.6427	40.9080	81
19	8.6128	0.1161	63.4397	0.0158	7.3658	0.1358	5.8375	42.9979	19
20	9.6463	0.1037	72.0524	0.0139	7.4694	0.1339	6.0202	44.9676	20
21	10.8038	0.0926	81.6987	0.0122	7.5620	0.1322	6.1913	46.8188	21
22	12.1003	0.0826	92.5026	0.0108	7.6446	0.1308	6.3514	48.5543	22
23	13.5523	0.0738	104.6029	0.0096	7.7184	0.1296	6.5010	50.1776	23
24	15.1786	0.0659	118.1552	0.0085	7.7843	0.1285	6.6406	51.6929	24
25	17.0001	0.0588	133.3339	0.0075	7.8431	0.1275	6.7708	53.1046	25
26	19.0401	0.0525	150.3339	0.0067	7.8957	0.1267	6.8921	54.4177	26
27	21.3249	0.0469	169.3740	0.0059	7.9426	0.1259	7.0049	55.6369	27
28	23.8839	0.0419	190.6989	0.0052	7.9844	0.1252	7.1098	56.7674	28
29	26.7499	0.0374	214.5828	0.0047	8.0218	0.1247	7.2071	57.8141	29
30	29.9599	0.0334	241.3327	0.0041	8.0552	0.1241	7.2974	58.7821	30

4B) A mutual stock fund has grown at a rate of 12% compounded annually since its beginning. If it is anticipated that it will continue to grow at this rate, estimate the amount to be invested every year so that ₹60,000 will be accumulated at the end of 12 years. (2)

12.0%

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1	1.1200	0.8929	1.0000	1.0000	0.8929	1.1200	0.0000	0.0000	1
2	1.2544	0.7972	2.1200	0.4717	1.6901	0.5917	0.4717	0.7972	2
3	1.4049	0.7118	3.3744	0.2963	2.4018	0.4163	0.9246	2.2208	3
4	1.5735	0.6355	4.7793	0.2092	3.0373	0.3292	1.3589	4.1273	4
5	1.7623	0.5674	6.3528	0.1574	3.6048	0.2774	1.7746	6.3970	5
6	1.9738	0.5066	8.1152	0.1232	4.1114	0.2432	2.1720	8.9302	6
7	2.2107	0.4523	10.0890	0.0991	4.5638	0.2191	2.5515	11.6443	7
8	2.4760	0.4039	12.2997	0.0813	4.9676	0.2013	2.9131	14.4714	8
9	2.7731	0.3606	14.7757	0.0677	5.3282	0.1877	3.2574	17.3563	9
10	3.1058	0.3220	17.5487	0.0570	5.6502	0.1770	3.5847	20.2541	10
11	3.4785	0.2875	20.6546	0.0484	5.9377	0.1684	3.8953	23.1288	11
12	3.8960	0.2567	24.1331	0.0414	6.1944	0.1614	4.1897	25.9523	12
13	4.3635	0.2292	28.0291	0.0357	6.4235	0.1557	4.4683	28.7024	13
14	4.8871	0.2046	32.3926	0.0309	6.6282	0.1509	4.7317	31.3624	14
15	5.4736	0.1827	37.2797	0.0268	6.8109	0.1468	4.9803	33.9202	15
16	6.1304	0.1631	42.7533	0.0234	6.9740	0.1434	5.2147	36.3670	16
17	6.8660	0.1456	48.8837	0.0205	7.1196	0.1405	5.4353	38.6973	17
18	7.6900	0.1300	55.7497	0.0179	7.2497	0.1379	5.6427	40.9080	81
19	8.6128	0.1161	63.4397	0.0158	7.3658	0.1358	5.8375	42.9979	19
20	9.6463	0.1037	72.0524	0.0139	7.4694	0.1339	6.0202	44.9676	20
21	10.8038	0.0926	81.6987	0.0122	7.5620	0.1322	6.1913	46.8188	21
22	12.1003	0.0826	92.5026	0.0108	7.6446	0.1308	6.3514	48.5543	22
23	13.5523	0.0738	104.6029	0.0096	7.7184	0.1296	6.5010	50.1776	23
24	15.1786	0.0659	118.1552	0.0085	7.7843	0.1285	6.6406	51.6929	24
25	17.0001	0.0588	133.3339	0.0075	7.8431	0.1275	6.7708	53.1046	25
26	19.0401	0.0525	150.3339	0.0067	7.8957	0.1267	6.8921	54.4177	26
27	21.3249	0.0469	169.3740	0.0059	7.9426	0.1259	7.0049	55.6369	27
28	23.8839	0.0419	190.6989	0.0052	7.9844	0.1252	7.1098	56.7674	28
29	26.7499	0.0374	214.5828	0.0047	8.0218	0.1247	7.2071	57.8141	29
30	29.9599	0.0334	241.3327	0.0041	8.0552	0.1241	7.2974	58.7821	30

4C) You are considering purchasing a piece of industrial equipment that costs ₹30,000. You decide to make a down payment in the amount of ₹5,000 and to borrow the remainder from a local bank at an interest rate of 9%, compounded monthly. The loan is to be paid off in 36 monthly instalments. Estimate the amount of monthly payment. (3)

9.0%

N	Single Payment: Compound Amount Factor (F/P,i,N)	Single Payment: Present Worth Factor (P/F,i,N)	Equal Payment Series: Compound Amount Factor (F/A,i,N)	Equal Payment Series: Sinking Fund Factor (A/F,i,N)	Equal Payment Series: Present Worth Factor (P/A,i,N)	Equal Payment Series: Capital Recovery Factor (A/P,i,N)	Gradient Series: Gradient Uniform Series (A/G,i,N)	Gradient Series: Gradient Present Worth (P/G,i,N)	N
1	1.0900	0.9174	1.0000	1.0000	0.9174	1.0900	0.0000	0.0000	1
2	1.1881	0.8417	2.0900	0.4785	1.7591	0.5685	0.4785	0.8417	2
3	1.2950	0.7722	3.2781	0.3051	2.5313	0.3951	0.9426	2.3860	3
4	1.4116	0.7084	4.5731	0.2187	3.2397	0.3087	1.3925	4.5113	4
5	1.5386	0.6499	5.9847	0.1671	3.8897	0.2571	1.8282	7.1110	5
6	1.6771	0.5963	7.5233	0.1329	4.4859	0.2229	2.2498	10.0924	6
7	1.8280	0.5470	9.2004	0.1087	5.0330	0.1987	2.6574	13.3746	7
8	1.9926	0.5019	11.0285	0.0907	5.5348	0.1807	3.0512	16.8877	8
9	2.1719	0.4604	13.0210	0.0768	5.9952	0.1668	3.4312	20.5711	9
10	2.3674	0.4224	15.1929	0.0658	6.4177	0.1558	3.7978	24.3728	10
11	2.5804	0.3875	17.5603	0.0569	6.8052	0.1469	4.1510	28.2481	11
12	2.8127	0.3555	20.1407	0.0497	7.1607	0.1397	4.4910	32.1590	12
13	3.0658	0.3262	22.9534	0.0436	7.4869	0.1336	4.8182	36.0731	13
14	3.3417	0.2992	26.0192	0.0384	7.7862	0.1284	5.1326	39.9633	14
15	3.6425	0.2745	29.3609	0.0341	8.0607	0.1241	5.4346	43.8069	15
16	3.9703	0.2519	33.0034	0.0303	8.3126	0.1203	5.7245	47.5849	16
17	4.3276	0.2311	36.9737	0.0270	8.5436	0.1170	6.0024	51.2821	17
18	4.7171	0.2120	41.3013	0.0242	8.7556	0.1142	6.2687	54.8860	18
19	5.1417	0.1945	46.0185	0.0217	8.9501	0.1117	6.5236	58.3868	19
20	5.6044	0.1784	51.1601	0.0195	9.1285	0.1095	6.7674	61.7770	20
21	6.1088	0.1637	56.7645	0.0176	9.2922	0.1076	7.0006	65.0509	21
22	6.6586	0.1502	62.8733	0.0159	9.4424	0.1059	7.2232	68.2048	22
23	7.2579	0.1378	69.5319	0.0144	9.5802	0.1044	7.4357	71.2359	23
24	7.9111	0.1264	76.7898	0.0130	9.7066	0.1030	7.6384	74.1433	24
25	8.6231	0.1160	84.7009	0.0118	9.8226	0.1018	7.8316	76.9265	25
26	9.3992	0.1064	93.3240	0.0107	9.9290	0.1007	8.0156	79.5863	26
27	10.2451	0.0976	102.7231	0.0097	10.0266	0.0997	8.1906	82.1241	27
28	11.1671	0.0895	112.9682	0.0089	10.1161	0.0989	8.3571	84.5419	28
29	12.1722	0.0822	124.1354	0.0081	10.1983	0.0981	8.5154	86.8422	29
30	13.2677	0.0754	136.3075	0.0073	10.2737	0.0973	8.6657	89.0280	30
31	14.4618	0.0691	149.5752	0.0067	10.3428	0.0967	8.8083	91.1024	31
32	15.7633	0.0634	164.0370	0.0061	10.4062	0.0961	8.9436	93.0690	32
33	17.1820	0.0582	179.8003	0.0056	10.4644	0.0956	9.0718	94.9314	33
34	18.7284	0.0534	196.9823	0.0051	10.5178	0.0951	9.1933	96.6935	34
35	20.4140	0.0490	215.7108	0.0046	10.5668	0.0946	9.3083	98.3590	35
40	31.4094	0.0318	337.8824	0.0030	10.7574	0.0930	9.7957	105.3762	40
45	48.3273	0.0207	525.8587	0.0019	10.8812	0.0919	10.1603	110.5561	45
50	74.3575	0.0134	815.0836	0.0012	10.9617	0.0912	10.4295	114.3251	50
55	114.4083	0.0087	1260.0918	0.0008	11.0140	0.0908	10.6261	117.0362	55
60	176.0313	0.0057	1944.7921	0.0005	11.0480	0.0905	10.7683	118.9683	60

5A) A company is planning to install a new automated plastic-molding press. Four different presses are available. The initial capital investments and annual expenses for these four mutually exclusive alternatives are as follows: (3)

	Press			
	P1	P2	P3	P4
Capital investment	$24,000	$30,400	$49,600	$52,000
Useful life (years)	5	5	5	5
Annual expenses				
Power	2,720	2,720	4,800	5,040
Labor	26,400	24,000	16,800	14,800
Maintenance	1,600	1,800	2,600	2,000
Property taxes and insurance	480	608	992	1,040
Total annual expenses	$31,200	$29,128	$25,192	$22,880

Assume that each press has the same output capacity (120,000 units per year) and has no market value at the end of its useful life; the selected analysis period is five years; and any additional capital invested is expected to earn at least 10% per year. Compare and suggest the best press if 120,000 non-defective units per year are produced by each press and all units can be sold. The selling price is $0.375 per unit.

5B) Suppose that an oil well is expected to produce 100,000 barrels of oil during its first year of production. However, its subsequent production (yield) is expected to decrease by 5000 barrels over the previous year's production. The oil well has a proven reserve of 1,000,000 barrels. (4)

i) Suppose that the price of oil is expected to be ₹60 per barrel for the next several years. What would be the present worth of the anticipated revenue stream at an interest rate of 8% compounded annually over the next seven years?
ii) Suppose that the price of oil is expected to start at ₹60 per barrel during the first year, but to increase at the constant value of ₹5 over the previous year's price. What would be the present worth of the anticipated revenue stream at an interest rate of 8% compounded annually over the next seven years?

5C) Yellow Pages directory company must decide whether it should compose the ads for its clients in-house or pay a production company to compose them. To develop the ads in-house, the company will have to purchase computers, printers, and other peripherals at a cost of ₹12,000. The equipment will have a useful life of 3 years, after which it will be sold for ₹2000. The employee who creates the ads will be paid ₹45,000 per year. In addition, each ad will have an average cost of ₹8 to prepare for delivery to the printer. A total of 4000 ads are anticipated for the next few years. Alternatively, the company can outsource ad development at a fee of ₹20 per ad regardless of the quantity. The current interest rate is 8% per year. What is the breakeven amount, and which alternative is economically better? (3)

8.0%

	Single Payment		Equal Payment Series				Gradient Series		
N	Compound Amount Factor (F/P,i,N)	Present Worth Factor (P/F,i,N)	Compound Amount Factor (F/A,i,N)	Sinking Fund Factor (A/F,i,N)	Present Worth Factor (P/A,i,N)	Capital Recovery Factor (A/P,i,N)	Gradient Uniform Series (A/G,i,N)	Gradient Present Worth (P/G,i,N)	N
1	1.0800	0.9259	1.0000	1.0000	0.9259	1.0800	0.0000	0.0000	1
2	1.1664	0.8573	2.0800	0.4808	1.7833	0.5608	0.4808	0.8573	2
3	1.2597	0.7938	3.2464	0.3080	2.5771	0.3880	0.9487	2.4450	3
4	1.3605	0.7350	4.5061	0.2219	3.3121	0.3019	1.4040	4.6501	4
5	1.4693	0.6806	5.8666	0.1705	3.9927	0.2505	1.8465	7.3724	5
6	1.5869	0.6302	7.3359	0.1363	4.6229	0.2163	2.2763	10.5233	6
7	1.7138	0.5835	8.9228	0.1121	5.2064	0.1921	2.6937	14.0242	7
8	1.8509	0.5403	10.6366	0.0940	5.7466	0.1740	3.0985	17.8061	8
9	1.9990	0.5002	12.4876	0.0801	6.2469	0.1601	3.4910	21.8081	9
10	2.1589	0.4632	14.4866	0.0690	6.7101	0.1490	3.8713	25.9768	10
11	2.3316	0.4289	16.6455	0.0601	7.1390	0.1401	4.2395	30.2657	11
12	2.5182	0.3971	18.9771	0.0527	7.5361	0.1327	4.5957	34.6339	12
13	2.7196	0.3677	21.4953	0.0465	7.9038	0.1265	4.9402	39.0463	13
14	2.9372	0.3405	24.2149	0.0413	8.2442	0.1213	5.2731	43.4723	14
15	3.1722	0.3152	27.1521	0.0368	8.5595	0.1168	5.5945	47.8857	15
16	3.4259	0.2919	30.3243	0.0330	8.8514	0.1130	5.9046	52.2640	16
17	3.7000	0.2703	33.7502	0.0296	9.1216	0.1096	6.2037	56.5883	17
18	3.9960	0.2502	37.4502	0.0267	9.3719	0.1067	6.4920	60.8426	18
19	4.3157	0.2317	41.4463	0.0241	9.6036	0.1041	6.7697	65.0134	19
20	4.6610	0.2145	45.7620	0.0219	9.8181	0.1019	7.0369	69.0898	20
21	5.0338	0.1987	50.4229	0.0198	10.0168	0.0998	7.2940	73.0629	21
22	5.4365	0.1839	55.4568	0.0180	10.2007	0.0980	7.5412	76.9257	22
23	5.8715	0.1703	60.8933	0.0164	10.3711	0.0964	7.7786	80.6726	23
24	6.3412	0.1577	66.7648	0.0150	10.5288	0.0950	8.0066	84.2997	24
25	6.8485	0.1460	73.1059	0.0137	10.6748	0.0937	8.2254	87.8041	25
26	7.3964	0.1352	79.9544	0.0125	10.8100	0.0925	8.4352	91.1842	26
27	7.9881	0.1252	87.3508	0.0114	10.9352	0.0914	8.6363	94.4390	27
78	8.6271	0.1159	95.3388	0.0105	11.0511	0.0905	8.8289	97.5687	28
29	9.3173	0.1073	103.9659	0.0096	11.1584	0.0896	9.0133	100.5738	29
30	10.0627	0.0994	113.2832	0.0088	11.2578	0.0888	9.1897	103.4558	30
31	10.8677	0.0920	123.3459	0.0081	11.3498	0.0881	9.3584	106.2163	31
32	11.7371	0.0852	134.2135	0.0075	11.4350	0.0875	9.5197	108.8575	32
33	12.6760	0.0789	145.9506	0.0069	11.5139	0.0869	9.6737	111.3819	33
34	13.6901	0.0730	158.6267	0.0063	11.5869	0.0863	9.8208	113.7924	34
35	14.7853	0.0676	172.3168	0.0058	11.6546	0.0858	9.9611	116.0920	35
40	21.7245	0.0460	259.0565	0.0039	11.9246	0.0839	10.5699	126.0422	40
45	31.9204	0.0313	386.5056	0.0026	12.1084	0.0826	11.0447	133.7331	45
50	46.9016	0.0213	573.7702	0.0017	12.2335	0.0817	11.4107	139.5928	50
55	68.9139	0.0145	848.9232	0.0012	12.3186	0.0812	11.6902	144.0065	55
60	101.2571	0.0099	1253.2133	0.0008	12.3766	0.0808	11.9015	147.3000	60

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