Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

VI SEMESTER B.TECH. (COMMON TO ALL)

END SEMESTER EXAMINATIONS- APRIL 2019

SUBJECT: ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT [HUM 4002]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data may be suitably assumed.
- Interest factor table is provided in the last page (else use formulae).

1A.	Polymer Molding, Inc., is considering two processes for manufacturing storm drains. **Plan A** involves conventional injection molding that will require making a steel mold at a cost of $2 million. The cost for inspecting, maintaining, and cleaning the molds is expected to be $5000 per month. The salvage value for plan A is expected to be 10% of the first cost, with a service life of 3 years. **Plan B** involves using an innovative process known as virtual engineered composites. The first cost of the alternative is $25,000, but because of the newness of the process, personnel and product-reject costs are expected to be higher than those for a conventional process. The company expects the operating costs to be $45,000 per month for the first 8 months and then to decrease to $10,000 per month for the next 3years. There will be no salvage value with this plan. At an interest rate of 12% per year, compounded monthly, which process should the company select on the basis of an annual worth analysis?	**(04)**
1B.	A city that is attempting to attract a professional football team is planning to build a new stadium costing $250 million. Annual upkeep is expected to amount to $800,000 per year. The artificial turf will have to be replaced every 10 years at a cost of $950,000. Painting every 5 years will cost $75,000. If the city expects to maintain the facility indefinitely, what will be its capitalized cost at an interest rate of 8% per year?	**(03)**
1C.	From the given information determine the sales of the firm? Current ratio: 1.4 Acid test ratio: 1.2 Inventory turnover ratio: 8 Current liabilities: 1600 INR.	**(03)**
2A.	Differentiate between microeconomics and macroeconomics.	**(02)**

2B.	One of the four ovens at a bakery is being considered for replacement. Its salvage value and maintenance costs are given in the table below for several years. A new oven costs $80,000 and this price includes a complete guarantee of the maintenance costs for the first two years, and it covers a good proportion of the maintenance costs for years 3 and 4. The salvage value and maintenance costs are also summarized in the table. Both the old and new ovens have similar productivities and energy costs. Should the oven be replaced this year? If the interest rate is 8% conduct replacement analysis based on the economic life of the asset.	**(05)**
2C.	A construction contractor has three options to purchase a dump truck for transportation and dumping of earth at a construction site. All the alternatives have the same useful life of 10 years. The cash flow details of all the alternatives are presented as follows; **Option-1:** Initial purchase price = Rs.2500000, Annual operating cost Rs.45000 at the end of 1st year and increasing by Rs.3000 in the subsequent years till the end of useful life, Annual income = Rs.120000, Salvage value = Rs.550000. **Option-2:** Initial purchase price = Rs.3000000, Annual operating cost = Rs.30000, Annual income Rs.150000 for first three years and increasing by Rs.5000 in the subsequent years till the end of useful life, Salvage value = Rs.800000. **Option-3:** Initial purchase price = Rs.2700000, Annual operating cost Rs.35000 for first 5 years and increasing by Rs.2000 in the successive years till the end of useful life, Annual income = Rs.140000, Expected salvage value = Rs.650000. Using future worth method, find out which alternative should be selected, if the rate of interest is 8% per year.	**(03)**
3A.	A series of ten quarterly payments of $1500 at the rate of 12 percent per annum compounded quarterly is equivalent to three semi-annual withdrawals from the third year. What is the amount of these three payments? If the three withdrawals are annual from the fourth year, recalculate the amount.	**(04)**
3B.	A company is planning to introduce a new product in near future. In order to have sufficient money for investment, it plans to save some equal amounts every six months for the next five years. In the fifth year the company acquires patent rights to the new product by investing $1000000. However, the manufacturing of the new product is expected to initiate in the second quarter of the seventh year with an investment of $10000 and an increase of $1000 per quarter for the next six quarters. If the interest rate is 10% compounded semi-annually during the first two years, 12% compounded semi-annually for the next three years, 13% compounded quarterly for the following two years and 16% compounded quarterly thereafter, calculate the money to be invested.	**(06)**
4A.	If an amount of 1000 INR is invested now, how much time would it take to double itself if the required rate of return is 12%?	**(02)**

Old oven		New oven	
Year	Salvage value end of the year ($)	Maintenance costs ($)	Salvage value end of the year ($)	Maintenance costs ($)
0	20,000	-	80,000	-
1	17,000	9,500	75,000	0
2	14,000	9,600	70,000	0
3	11,000	9,700	66,000	$1,000
4	7,000	9,800	62,000	$3,000

4B. NY Ltd. is planning to sell its nine years old containerized transport vehicles which were purchased for $350,000 each with a service life of 15 years and a market value which was expected to **decrease** by $21,000 each year. The operating cost is expected to be $15,000 every year, with a salvage value of $40,000 at the end of its life. Alternatively, the company can purchase a new vehicle for $375,000 with a service life of 15 years and salvage value of $90,000 and an equivalent annual cost of $5,000 in the first year and then increases by $800 every year thereafter. If the MARR is 8% per year, conduct the replacement analysis now and suggest whether or not the new vehicle has to be purchased. **(04)**

4C. Consider the cash flows for the project alternatives given below. **(04)**

n (Year)	A($)	B($)	C($)
0	-1000	-1000	-2000
1	900	600	900
2	500	500	900
3	100	500	900
4	50	100	900
Project IRR	34.57%	31.47%	28.57%

Assume that the MARR is 12%. Suppose A, B and C are mutually exclusive projects, which project alternatives are to be selected using incremental ROR evaluation.

5A. A Mining Company has purchased a computer-controlled gold ore grading unit for $80,000. The unit has an anticipated life of 10 years and a salvage value of $10,000. Using the Double Declining Balance method, draw up a schedule of depreciation and book values for each year. **(04)**

5B. Suppose that an oil well is expected to produce 100,000 barrels of oil during its first year in 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. **(03)**

a. 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?

b. 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? **(03)**

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8% Compound Interest Factors 8%

	Single Payment		Uniform Payment Series				Arithmetic Gradient		
	Compound Amount Factor	Present Worth Factor	Sinking Fund Factor	Capital Recovery Factor	Compound Amount Factor	Present Worth Factor	Gradient Uniform Series	Gradient Present Worth	
	Find *F* Given *P*	Find *P* Given *F*	Find *A* Given *F*	Find *A* Given *P*	Find *F* Given *A*	Find *P* Given *A*	Find *A* Given *G*	Find *P* Given *G*	
n	*F/P*	*P/F*	*A/F*	*A/P*	*F/A*	*P/A*	*A/G*	*P/G*	*n*
1	1.080	.9259	1.0000	1.0800	1.000	0.926	0	0	1
2	1.166	.8573	.4808	.5608	2.080	1.783	0.481	0.857	2
3	1.260	.7938	.3080	.3880	3.246	2.577	0.949	2.445	3
4	1.360	.7350	.2219	.3019	4.506	3.312	1.404	4.650	4
5	1.469	.6806	.1705	.2505	5.867	3.993	1.846	7.372	5
6	1.587	.6302	.1363	.2163	7.336	4.623	2.276	10.523	6
7	1.714	.5835	.1121	.1921	8.923	5.206	2.694	14.024	7
8	1.851	.5403	.0940	.1740	10.637	5.747	3.099	17.806	8
9	1.999	.5002	.0801	.1601	12.488	6.247	3.491	21.808	9
10	2.159	.4632	.0690	.1490	14.487	6.710	3.871	25.977	10
11	2.332	.4289	.0601	.1401	16.645	7.139	4.240	30.266	11
12	2.518	.3971	.0527	.1327	18.977	7.536	4.596	34.634	12
13	2.720	.3677	.0465	.1265	21.495	7.904	4.940	39.046	13
14	2.937	.3405	.0413	.1213	24.215	8.244	5.273	43.472	14
15	3.172	.3152	.0368	.1168	27.152	8.559	5.594	47.886	15
16	3.426	.2919	.0330	.1130	30.324	8.851	5.905	52.264	16
17	3.700	.2703	.0296	.1096	33.750	9.122	6.204	56.588	17
18	3.996	.2502	.0267	.1067	37.450	9.372	6.492	60.843	18
19	4.316	.2317	.0241	.1041	41.446	9.604	6.770	65.013	19
20	4.661	.2145	.0219	.1019	45.762	9.818	7.037	69.090	20
21	5.034	.1987	.0198	.0998	50.423	10.017	7.294	73.063	21
22	5.437	.1839	.0180	.0980	55.457	10.201	7.541	76.926	22
23	5.871	.1703	.0164	.0964	60.893	10.371	7.779	80.673	23
24	6.341	.1577	.0150	.0950	66.765	10.529	8.007	84.300	24
25	6.848	.1460	.0137	.0937	73.106	10.675	8.225	87.804	25

Interest rate for 12%

n	*F/P*	*P/F*	*A/F*	*A/P*	*F/A*	*P/A*	*A/G*	*P/G*	*n*
1	1.120	.8929	1.0000	1.1200	1.000	0.893	0	0	1
2	1.254	.7972	.4717	.5917	2.120	1.690	0.472	0.797	2
3	1.405	.7118	.2963	.4163	3.374	2.402	0.925	2.221	3
4	1.574	.6355	.2092	.3292	4.779	3.037	1.359	4.127	4
5	1.762	.5674	.1574	.2774	6.353	3.605	1.775	6.397	5
6	1.974	.5066	.1232	.2432	8.115	4.111	2.172	8.930	6
7	2.211	.4523	.0991	.2191	10.089	4.564	2.551	11.644	7
8	2.476	.4039	.0813	.2013	12.300	4.968	2.913	14.471	8
9	2.773	.3606	.0677	.1877	14.776	5.328	3.257	17.356	9
10	3.106	.3220	.0570	.1770	17.549	5.650	3.585	20.254	10
11	3.479	.2875	.0484	.1684	20.655	5.938	3.895	23.129	11
12	3.896	.2567	.0414	.1614	24.133	6.194	4.190	25.952	12
13	4.363	.2292	.0357	.1557	28.029	6.424	4.468	28.702	13
14	4.887	.2046	.0309	.1509	32.393	6.628	4.732	31.362	14
15	5.474	.1827	.0268	.1468	37.280	6.811	4.980	33.920	15
16	6.130	.1631	.0234	.1434	42.753	6.974	5.215	36.367	16
17	6.866	.1456	.0205	.1405	48.884	7.120	5.435	38.697	17
18	7.690	.1300	.0179	.1379	55.750	7.250	5.643	40.908	18
19	8.613	.1161	.0158	.1358	63.440	7.366	5.838	42.998	19
20	9.646	.1037	.0139	.1339	72.052	7.469	6.020	44.968	20
21	10.804	.0926	.0122	.1322	81.699	7.562	6.191	46.819	21
22	12.100	.0826	.0108	.1308	92.503	7.645	6.351	48.554	22
23	13.552	.0738	.00956	.1296	104.603	7.718	6.501	50.178	23
24	15.179	.0659	.00846	.1285	118.155	7.784	6.641	51.693	24
25	17.000	.0588	.00750	.1275	133.334	7.843	6.771	53.105	25