Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL

V SEMESTER B.TECH. (COMMON TO ALL)

END SEMESTER EXAMINATIONS- JAN 2021(ONLINE)

SUBJECT: ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT [HUM 3051]

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.	A three-year-old machine purchased for $130,000 is not able to meet today's market demands. The machine can be sold to a sub-contracting company for $40,000. The current machine will have an annual operating cost of $85,000 and salvage value of $30,000 in three years. The new machine which will serve the company now for at least 8 years, will cost $220,000. Its salvage value will be $10,000 at the end of eighth year. It will have an estimated operating cost of $65,000 per year. You are required to perform a replacement analysis at 12% per year and decide on the best course of action.	**(05)**
1B.	The following equation describes the conversion of a cash flow into a Present Worth series, P = 100(P/A,12%,10) + 120(P/A,12%,10)*(P/F,12%,10) + (5+25(A/G,12%,5))*(F/A,12%,5)*(P/F, 12%,20) – 200 - (50+25(A/G,12%,4))*(P/A,12%,4)*(P/F,12%,1) – 125(P/A,12%,5)*(P/F,12%,5) – 150(F/A,12%,8)*(P/F,12%,20) – (50-10(A/G,12%,5))*(P/A,12%,5)*(P/F,12%,15). Reconstruct the original cash flow diagram.	**(05)**
2A.	Determine the sales of a firm given the following information: Current ratio: 1.4 Acid test ratio : 1.2 Current liabilities : 1600 Inventory turn-over ratio : 8	**(05)**
2B.	Explain briefly and clearly how the topics covered under 'Time value of Money' and 'Evaluation of alternatives' might help you, for instance, while making a decision how to pay for your laptop purchase on credit payment. Could the topics you learnt influence how you choose the type of laptop to buy?	**(05)**

3A.	Sam Health Care, Inc. purchased a new sonogram imaging unit for $300,000 and had it mounted on a truck body for an additional $100,000, including the truck chassis. The unit-truck system will be depreciated as one asset. The functional life is 8 years, and salvage is` estimated at 10% of the purchase price of the imaging unit. Compare the annual depreciation and the book value until year 4 using a) Straight line depreciation and b) Double Declining Balance method.	**(05)**
3B.	Sally McCarthy is an engineer for a new power plant. The plant can be fired by natural gas, fuel oil, or coal. A decision must be made on which fuel to use. An analysis of the costs shows that the installed cost, with all controls, would be least for natural gas at $30,000; for fuel oil it would be $55,000; and for coal it would be $180,000. If natural gas is used rather than fuel oil, the annual fuel cost will increase by $7500. If coal is used rather than fuel oil, the annual fuel cost will be $15,000 per year less. Assuming 12% interest, a 20-year analysis period, and no salvage value, which is the most economical installation?	**(05)**
4A.	A series of monthly deposits of Rs.300 is made into a savings account for the next three years. Later, the deposit amount is increased to Rs.700 for the next 10 years on a quarterly basis. The account also consists of semi-annual withdrawals of Rs.500 for 13 years starting one year from now. Calculate the amount remaining in the account at the end of thirteenth year if the interest rate is 12 percent per annum compounded monthly.	**(05)**
4B.	A motor is required to drive a pump to remove water from a tunnel. The unit will be needed for a period of 5 years. The following alternatives are under consideration. Alternative X calls for the construction of a power line and purchase of the electric motor at a total cost of $4800. The salvage value of this equipment after 5 years is estimated to be $700. The cost of electricity for per hour of the operation is estimated to be $2.84 and the maintenance is estimated as $390 per year. Alternative Y calls for purchase of diesel engine pump set at a cost of $1725 and it will have no salvage value at the end of 5 years period. The cost of diesel per hour of operation is estimated at $1.46 maintenance is estimated at $0.51 per hour operation and the cost of wages chargeable when the engine runs is $2.75 per hour. How many hours per year the two machines have to run so that the two alternatives incur equal costs. If the no. of hours of operation is estimated at 100 hours which alternative is more economical? Take interest rate at 12% per year.	**(05)**
5A.	A non-government agency is funding annual seminar on campus by using earnings of a $100,000 gift. It is estimated that 12% interest rate will be realized in the first 10 years, but only 6% may be anticipated after that. i. What uniform annual payment may be established from the beginning to fund the seminar at the same level into infinity? ii. An additional gift of $10000 was received in the agency at the end of 5 years, which they have deposited in the seminar account. What will be the new annual payment starting from 6th year to infinity?	**(05)**

5B.	Let X = Last digit of your registration number (***Note:*** If last digit of your registration number is either 0 or 1, then, assume X= 12) Certain kind of machine has a first-year maintenance cost of $300 which increases by $50 per year over the 10-year useful life of the machine. Answer the following if the firm's interest rate is 12%. i. What equal annual payments could the firm make to a service organization to carry out the maintenance for X number of machines? ii. How much additionally could be paid for a new type of machine with the same useful life that requires no maintenance during its life?	**(05)**

Interest rate for 12%

12% Compound Interest Factors 12%

	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	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
26	19.040	.0525	.00665	.1267	150.334	7.896	6.892	54.418	26
27	21.325	.0469	.00590	.1259	169.374	7.943	7.005	55.637	27
28	23.884	.0419	.00524	.1252	190.699	7.984	7.110	56.767	28
29	26.750	.0374	.00466	.1247	214.583	8.022	7.207	57.814	29
30	29.960	.0334	.00414	.1241	241.333	8.055	7.297	58.782	30
31	33.555	.0298	.00369	.1237	271.293	8.085	7.381	59.676	31
32	37.582	.0266	.00328	.1233	304.848	8.112	7.459	60.501	32
33	42.092	.0238	.00292	.1229	342.429	8.135	7.530	61.261	33
34	47.143	.0212	.00260	.1226	384.521	8.157	7.596	61.961	34
35	52.800	.0189	.00232	.1223	431.663	8.176	7.658	62.605	35
40	93.051	.0107	.00130	.1213	767.091	8.244	7.899	65.116	40
45	163.988	.00610	.00074	.1207	1 358.2	8.283	8.057	66.734	45
50	289.002	.00346	.00042	.1204	2 400.0	8.304	8.160	67.762	50
55	509.321	.00196	.00024	.1202	4 236.0	8.317	8.225	68.408	55
60	897.597	.00111	.00013	.1201	7 471.6	8.324	8.266	68.810	60
65	1 581.9	.00063	.00008	.1201	13 173.9	8.328	8.292	69.058	65
70	2 787.8	.00036	.00004	.1200	23 223.3	8.330	8.308	69.210	70
75	4 913.1	.00020	.00002	.1200	40 933.8	8.332	8.318	69.303	75
80	8 658.5	.00012	.00001	.1200	72 145.7	8.332	8.324	69.359	80
85	15 259.2	.00007	.00001	.1200	127 151.7	8.333	8.328	69.393	85
90	26 891.9	.00004		.1200	224 091.1	8.333	8.330	69.414	90
95	47 392.8	.00002		.1200	394 931.4	8.333	8.331	69.426	95
100	83 522.3	.00001		.1200	696 010.5	8.333	8.332	69.434	100