5A) Determine the Sales of the company from the following data. **(5)**

- Current Ratio – 1.5
- Current Liabilities – Rs. 8,00,000
- Acid Test Ratio – 1.2
- Inventory Turnover Ratio – 8

5B) A 50 HP motor is required to drive a pump to remove water from a tunnel. The unit will be needed for a period of 4 years. **(5)**

Two alternatives are under consideration.

Alternative A calls for the construction of a power line and purchase of the electric motor at a total cost of $4900. The salvage value of this equipment after 4 years is estimated to be $700.

The cost of the power per hour of the operation is estimated to be $2.94 and the maintenance is estimated as $420 per year.

Alternative B calls for purchase of diesel engine pump set at a cost of $1925 and it will have no salvage value at the end of 4 years period. The cost of diesel per hour of operation is estimated at $1.47 maintenance is estimated at $0.53 per hour operation and the cost of wages chargeable when the engine runs is $2.8 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.

12% Compound Interest Factors 12%

	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	1.120	.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

Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VI SEMESTER B.TECH. (COMMON TO ALL)

END SEMESTER EXAMINATION, APRIL 2017

SUBJECT: ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT [HUM 4002]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL FIVE FULL** questions.
- **INTEREST TABLE** is provided in the last page (else use formula).
- Missing data may be suitably assumed.

1A) The Cadillac Motor Car Company is advertising a 24-month lease of a Cadillac Deville for $520, payable at the beginning of each month. The lease requires a $2,500 down payment, plus a $500 refundable security deposit. As an alternative, the company offers a 24-month lease with a single up-front payment of $12,780, plus a $500 refundable security deposit. The security deposit will be refunded at the end of the 24-month lease. Assuming an interest rate of 12%, compounded monthly, which lease is the preferred one? **(4)**

1B) A low-cost non-contact temperature measuring tool may be able to identify rail road car wheels that are in need of repair long before a costly structural failure occurs. If the tool is bought the railways would save $25,000 per quarter in the years 1 through 5 and this savings is expected to increase by $2500 every quarter in the years 6 through 20. What is the annual worth of savings over the 20 years? Interest rate is 12% per annum compounded quarterly. **(4)**

1C) A large food-processing corporation is considering using laser technology to speed up and eliminate waste in the potato-peeling process. To implement the system, the company anticipates needing $3.5 million to purchase the industrial strength lasers. The system will save $1,550,000 per year in labour and materials. However, it will require an additional operating and maintenance cost of $350,000. Annual income taxes will also increase by $150,000. The system is expected to have a 10-year service life and will have a salvage value of about $200,000. If the company's MARR is 12%, use the FW method to justify the economics of the project. **(2)**

2A) A suburban taxi company is considering buying taxis with diesel engines instead of gasoline engines. The cars average 50,000 km per year, with a useful life of 3 years for the taxi with the gas engine and 4 years for the diesel taxi. Other comparative information is as follows. **(4)**

(Costs in $)	Diesel	Gasoline
Vehicle cost	13,000	12,000
Fuel cost per liter	0.48	0.51
Mileage, in km/ liter	35	28
Annual repairs	300	200
Annual insurance premium	500	500
End-of-useful-life resale value	2,000	3,000

Use an annual cash flow analysis to determine the more economical choice if interest is 12%.

2B) A cooling-water pumping station at the LCRA plant costs $600,000 to construct, and it is projected to have a 25-year life with an estimated salvage value of 12% of the construction cost. However, the station will be book-depreciated to zero over a recovery period of 30 years. Calculate the annual depreciation charge for years 4, 10, and 25, using (a) Straight line depreciation and (b) DDB depreciation. **(4)**

2C) A couple is planning to finance its three-year-old son's college education. Money can be deposited at 12% compounded quarterly. What quarterly deposit must be made from the son's 3rd birthday to his 18th birthday to provide $50,000 on each birthday from the 18th to the 21st? (Note that the last deposit is made on the date of the first withdrawal.) **(2)**

3A) Midwest Power and Light operates 14 coal-fired power plants in several states around the United States. The company recently settled a lawsuit by agreeing to pay $60 million in mitigation costs related to acid rain. The settlement included $21 million to reduce emissions from barges and trucks in the Ohio River Valley, $24 million for projects to conserve energy and produce alternative energy, $3 million for Chesapeake Bay, $2 million for Shenandoah National Park, and $10 million to acquire ecologically sensitive lands in Appalachia. The question of how to distribute the money over time has been posed. Plan A involves spending $5 million now and the remaining $55 million equally over a 10-year period (that is, $5.5 million in each of years 1 through 10). Plan B requires expenditures of $5 million now, $25 million 2 years from now, and $30 million 7 years from now. Determine which plan is more economical on the basis of a present worth analysis over a 10-year period at an interest rate of 12% per year. **(5)**

3B) A special-purpose machine is to be purchased at a cost of $15,000. The following table shows the expected annual operating and maintenance cost and the salvage values for each year of the machine's service: **(5)**

Years of Service	O&M Costs	Market Value
1	$2500	$12800
2	$3200	$8100
3	$5300	$5200
4	$6500	$3500
5	$7800	$0

If the interest rate is 12%, what is the economic service life for this machine?

4A) The U.S. Bureau of Reclamation is considering five national park projects shown below, all of which can be considered to last indefinitely. At a MARR of 12% per year, determine which should be selected, if they are (a) Independent and (b) Mutually exclusive. **(4)**

Project ID	First Cost, $1000	Rate of Return %	Annual Income, $1000
A	-20000	10	2000
B	-10000	13	1300
C	-15000	6.6	1000
D	-70000	5.7	4000
E	-50000	5.2	2600

4B) A newly constructed building costs INR 5,00,00,000. The same building is estimated to need renovation every 15 years at a cost of INR 50,00,000. Annual repairs and maintenance are estimated to be INR 10,00,000 per year for the first seven years and then increases to an amount of INR 12,50,000 from the eighth year onwards till fifteenth year and afterwards to an amount of INR 15,00,000 per year forever. If the interest rate is 12%, determine the capitalized cost of the bridge. Also, what is its equivalent annual cost? **(3)**

4C) Air Links, a commuter airline company, is considering replacing one of its baggage handling machines with a newer and more efficient one. The current book value of the old machine is $50,000, and it has a remaining useful life of five years. The salvage value expected from scrapping the old machine at the end of five years is zero, but the company can sell the machine now to another firm in the industry for $10,000. The new baggage-handling machine has a purchase price of $120,000 and an estimated useful life of seven years. It has an estimated salvage value of $30,000 and is expected to realize economic savings on electric power usage, labor and repair costs and also to reduce the amount of damaged luggage. In total, an annual savings of $50,000 will be realized if the new machine is installed. The firm uses a 12% MARR. (a) What is the initial cash outlay required for the new machine? (b) What are the cash flows for the defender in years 0 to 5? (c) Should the airline purchase the new machine? **(3)**