

UNIVERSITY OF ESWATINI
MAIN EXAMINATION, SECOND SEMESTER
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FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONIC
ENGINEERING

TITLE OF PAPER: ENGINEERING MANAGEMENT

COURSE CODE: EEE512

TIME ALLOWED: THREE HOURS

INSTRUCTIONS:

1. There are six questions in this paper. Answer any FIVE questions.
Each question carries 20 marks.
2. If you think not enough data has been given in any question you may assume any reasonable values.
3. Useful formulas and Financial Table have been annexed to the paper.

PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS
BEEN GIVEN BY THE INVIGILATOR

THIS PAPER CONTAINS TWELVE (12) PAGES INCLUDING THIS PAGE

Question 1

Donna Jameson was recently hired as a financial analyst by Brickley Electronics, a manufacturer of electronic calculators. Her first task was to conduct a financial analysis of the firm covering the last two years. To begin, she gathered the following financial statements and other data.

BALANCE SHEETS	20x2 Ex000	20x1 Ex000
Assets:		
Current assets:		
Cash	1,200.00	2,350.00
Accounts receivable	6,000.00	4,000.00
Inventories	8,000.00	10,000.00
Prepaid expenses	300.00	120.00
Total current assets	<u>15,500.00</u>	<u>16,470.00</u>
Fixed assets		
Land	4000.00	4000.00
Buildings and equipment	12000.00	8500.00
Total fixed assets	<u>16000.00</u>	<u>12500.00</u>
Total assets	<u>31500.00</u>	<u>28970.00</u>
Liabilities and Equity:		
Current liabilities:		
Accounts payable	5,800.00	4,000.00
Notes payable	300.00	600.00
Accruals	900.00	400.00
Total current liabilities	<u>7,000.00</u>	<u>5,000.00</u>
Long term liabilities		
Long-term debt	7,500.00	8,000.00
Total liabilities	<u>14,500.00</u>	<u>13,000.00</u>
Equity:		
Stock	8,000.00	8,000.00
Paid in capital	1,000.00	1,000.00
Total paid in capital	<u>9,000.00</u>	<u>9,000.00</u>
Retained earnings	8,000.00	6,970.00
Total equity	<u>17,000.00</u>	<u>15,970.00</u>
Total liabilities and equity	<u>31,500.00</u>	<u>28,970.00</u>

INCOME STATEMENTS

Sales	52,000.00	48,000.00
Cost of goods sold	36,000.00	31,000.00
Gross margin	<u>16,000.00</u>	<u>17,000.00</u>
Operating expenses:		
Selling expenses	7,000.00	6,500.00
Administrative expenses	5,860.00	6,100.00
Total operating expenses	<u>12,860.00</u>	<u>12,600.00</u>
Net operating income (EBIT)	3,140.00	3,900.00
Interest expense	640.00	700.00
Net income before taxes	2,500.00	3,200.00
Income taxes (30%)	750.00	960.00
Net income (or net-profit margin)	<u>1,750.00</u>	<u>2,240.00</u>

INDUSTRY AVERAGE DATA FOR 20x2

<u>Ratio</u>	<u>Industry Average</u>
Current	2.7x
Quick	1.0x
Inventory turnover	7.0x
Days sales outstanding (DSO)	32.0 days
Fixed assets turnover	10.7x
Total assets turnover	2.6x
Debt ratio	50.00%
Times Interest Earned (TIE)	2.5x
Fixed charge coverage	2.1x
Profit margin	3.50%
Basic earning power	19.10%
ROA	9.10%
ROE	18.20%
Price/earnings	14.2x
Market/book	1.4x

As part of the strategy execution processes, you have been assigned to work with Donna Jameson to prepare a report which evaluates the company's financial condition, compares the performance with the industry and further recommend action to improve the financial performance of the company in the following years (if necessary).

(20 Marks)

Question 2

- a) Discuss 4 types of Engineering contracts (8 marks)

- b) The company has recently adopted the management by objectives (MBO) principles and has set out the objectives for the year. As an Engineer with 25 unionized employees, explain and motivate for the newly adopted process to the employees in your department. (10 marks)

- c) Why do organizations need policies and procedures? (2 marks)

Question 3

Perot Industries has E100 000.00 to invest. The company is trying to decide between two alternative uses of funds. The alternatives are:

Expected Net Cash Flow

Year	Project A	Project B
0	-E 100,000.00	-E 100,000.00
1	E21,000.00	E 16,000.00
2	E 21,000.00	E 16,000.00
3	E21,000.00	E 16,000.00
4	E 21,000.00	E 16,000.00
5	E21,000.00	E 16,000.00
6	E 29,000.00	E 16,000.00

As the Projects Engineer for Perot Industries, you have been requested to write a motivation to Management for the selection of either Project A or Project B. Management would like to know the following information

- The available methods for appraising projects and their advantages (5 marks)
- The payback period for each project (4 marks)
- At 14% cost of capital calculate the NPV of each project (4 marks)
- At 8% cost of capital calculate the NPV of each project (4 marks)
- Selection of project with reasons (3 marks)

Question 4

- a) As the engineer of your company, you have been tasked to share with the newly recruited graduate trainees on the characteristics and functions of management. As part of preps, list and discuss the characteristics and function of management. (15 marks)
- b) List the laws governing the following in Eswatini
- Registration of Engineers
 - Management of the environment
 - Employer and Employees Relationship
 - Employment
 - Safety in the workforce (5 marks)

Question 5

- a) Discuss the key roles of unions (4 marks)
- b) Discuss the various maintenance methods commonly used industries (12 marks)
- c) What is an Engineering contract and why is it important? (4 marks)

Question 6

Northwood Company has established a project management unit and has adopted the Project Management Body of Knowledge (PMBOK) framework to manage their projects. You have been appointed the Projects Engineer for Northwood Company and have to a conduct training session for the other engineers and technicians on the PMBOK framework. As part of the training preparations, list and discuss the elements of the PMBOK.

(20 marks)

Ratio **Formula for Calculation**

LIQUIDITY

Current $\frac{\text{Current Assets}}{\text{Current Liabilities}}$

Quick, or acid test $\frac{\text{Current assets} - \text{Inventories}}{\text{Current Liabilities}}$

**ASSET
MANAGEMENT**

Inventory Turnover $\frac{\text{Sales}}{\text{Inventories}}$

Day's sales outstanding (DSO) $\frac{\text{Receivables}}{\text{Annual sales}/360}$

Fixed assets turnover $\frac{\text{Sales}}{\text{Net Fixed assets}}$

Total assets turnover $\frac{\text{Sales}}{\text{Total assets}}$

DEBT MANAGEMENT

Total debt to total assets $\frac{\text{Total debt}}{\text{Total assets}}$

**Times-interest-earned
(TIE)** $\frac{\text{Earnings before interest and taxes (EBIT)}}{\text{interest charges}}$

Fixed Charge Coverage $\frac{\text{Earnings before interest and taxes} + \text{Lease payments}}{\text{Interest charges} + \text{Lease payments} + (\text{5F payments} / (1-T))}$

PROFITABILITY

Profit margin on sales

$$\frac{\text{Net Income available to common stockholders}}{\text{Sales}}$$

Basic earning power

$$\frac{\text{Earnings before Interest and Taxes (EBIT)}}{\text{Total Assets}}$$

Return on Total Assets (ROA)

$$\frac{\text{Net income available to common stockholders}}{\text{Total Assets}}$$

Return on Common Equity (ROE)

$$\frac{\text{Net Income available to common stockholders}}{\text{Common Equity}}$$

MARKET VALUE

Price /earning (P/E)

$$\frac{\text{Price Per Share}}{\text{Earnings Per Share}}$$

Market/book

$$\frac{\text{Market Price Per Share}}{\text{Book Value Per Share}}$$

Present Value of 1 due at the end of the year shown Various
Discounting Rates

Years	1%	2%	3%	4%	5%	6%	7%	8%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259
2	0.9803	0.9612	0.9426	0.9246	0.9070	0.8900	0.8734	0.8573
3	0.9706	0.9423	0.9151	0.8890	0.8638	0.8396	0.8163	0.7938
4	0.9610	0.9238	0.8885	0.8548	0.8227	0.7921	0.7629	0.7350
5	0.9515	0.9057	0.8626	0.8219	0.7835	0.7473	0.7130	0.6806
6	0.9420	0.8880	0.8375	0.7903	0.7462	0.7050	0.6663	0.6302
7	0.9327	0.8706	0.8131	0.7599	0.7107	0.6651	0.6227	0.5835
8	0.9235	0.8535	0.7894	0.7307	0.6768	0.6274	0.5820	0.5403
9	0.9143	0.8368	0.7664	0.7026	0.6446	0.5919	0.5439	0.5002
10	0.9053	0.8203	0.7441	0.6756	0.6139	0.5584	0.5083	0.4632
11	0.8963	0.8043	0.7224	0.6496	0.5847	0.5268	0.4751	0.4289
12	0.8874	0.7885	0.7014	0.6246	0.5568	0.4970	0.4440	0.3971
13	0.8787	0.7730	0.6810	0.6006	0.5303	0.4688	0.4150	0.3677
14	0.8700	0.7579	0.6611	0.5775	0.5051	0.4423	0.3878	0.3405
15	0.8613	0.7430	0.6419	0.5553	0.4810	0.4173	0.3624	0.3152
16	0.8528	0.7284	0.6232	0.5339	0.4581	0.3936	0.3387	0.2919
17	0.8444	0.7142	0.6050	0.5134	0.4363	0.3714	0.3166	0.2703
18	0.8360	0.7002	0.5874	0.4936	0.4155	0.3503	0.2959	0.2502
19	0.8277	0.6864	0.5703	0.4746	0.3957	0.3305	0.2765	0.2317
20	0.8195	0.6730	0.5537	0.4564	0.3769	0.3118	0.2584	0.2145
21	0.8114	0.6598	0.5375	0.4388	0.3589	0.2942	0.2415	0.1987
22	0.8034	0.6468	0.5219	0.4220	0.3418	0.2775	0.2257	0.1839
23	0.7954	0.6342	0.5067	0.4057	0.3256	0.2618	0.2109	0.1703
24	0.7876	0.6217	0.4919	0.3901	0.3101	0.2470	0.1971	0.1577
25	0.7798	0.6095	0.4776	0.3751	0.2953	0.2330	0.1842	0.1460
26	0.7720	0.5976	0.4637	0.3607	0.2812	0.2198	0.1722	0.1352
27	0.7644	0.5859	0.4502	0.3468	0.2678	0.2074	0.1609	0.1252
28	0.7568	0.5744	0.4371	0.3335	0.2551	0.1956	0.1504	0.1159
29	0.7493	0.5631	0.4243	0.3207	0.2429	0.1846	0.1406	0.1073
30	0.7419	0.5521	0.4120	0.3083	0.2314	0.1741	0.1314	0.0994
31	0.7346	0.5412	0.4000	0.2965	0.2204	0.1643	0.1228	0.0920
32	0.7273	0.5306	0.3883	0.2851	0.2099	0.1550	0.1147	0.0852
33	0.7201	0.5202	0.3770	0.2741	0.1999	0.1462	0.1072	0.0789
34	0.7130	0.5100	0.3660	0.2636	0.1904	0.1379	0.1002	0.0730
35	0.7059	0.5000	0.3554	0.2534	0.1813	0.1301	0.0937	0.0676
36	0.6989	0.4902	0.3450	0.2437	0.1727	0.1227	0.0875	0.0626
37	0.6920	0.4806	0.3350	0.2343	0.1644	0.1158	0.0818	0.0580
38	0.6852	0.4712	0.3252	0.2253	0.1566	0.1092	0.0765	0.0537
39	0.6784	0.4619	0.3158	0.2166	0.1491	0.1031	0.0715	0.0497
40	0.6717	0.4529	0.3066	0.2083	0.1420	0.0972	0.0668	0.0460
41	0.6650	0.4440	0.2976	0.2003	0.1353	0.0917	0.0624	0.0426
42	0.6584	0.4353	0.2890	0.1926	0.1288	0.0865	0.0583	0.0395
43	0.6519	0.4268	0.2805	0.1852	0.1227	0.0816	0.0545	0.0365
44	0.6454	0.4184	0.2724	0.1780	0.1169	0.0770	0.0509	0.0338
45	0.6391	0.4102	0.2644	0.1712	0.1113	0.0727	0.0476	0.0313
46	0.6327	0.4022	0.2567	0.1646	0.1060	0.0685	0.0445	0.0290
47	0.6265	0.3943	0.2493	0.1583	0.1009	0.0647	0.0416	0.0269
48	0.6203	0.3865	0.2420	0.1522	0.0961	0.0610	0.0389	0.0249
49	0.6141	0.3790	0.2350	0.1463	0.0916	0.0575	0.0363	0.0230
50	0.6080	0.3715	0.2281	0.1407	0.0872	0.0543	0.0339	0.0213
51	0.6020	0.3642	0.2215	0.1353	0.0831	0.0512	0.0317	0.0197
52	0.5961	0.3571	0.2150	0.1301	0.0791	0.0483	0.0297	0.0183
53	0.5902	0.3501	0.2088	0.1251	0.0753	0.0456	0.0277	0.0169
54	0.5843	0.3432	0.2027	0.1203	0.0717	0.0430	0.0259	0.0157
55	0.5785	0.3365	0.1968	0.1157	0.0683	0.0406	0.0242	0.0145
56	0.5728	0.3299	0.1910	0.1112	0.0651	0.0383	0.0226	0.0134
57	0.5671	0.3234	0.1855	0.1069	0.0620	0.0361	0.0211	0.0124
58	0.5615	0.3171	0.1801	0.1028	0.0590	0.0341	0.0198	0.0115
59	0.5560	0.3109	0.1748	0.0989	0.0562	0.0321	0.0185	0.0107
60	0.5505	0.3048	0.1697	0.0951	0.0535	0.0303	0.0173	0.0099

Present Value of 1 due at the end of the year shown Various
Discounting Rates

Years	9%	10%	11%	12%	13%	14%	15%	16%
1	0.9174	0.9091	0.9009	0.8929	0.8850	0.8772	0.8696	0.8621
2	0.8417	0.8264	0.8116	0.7972	0.7831	0.7695	0.7561	0.7432
3	0.7722	0.7513	0.7312	0.7118	0.6931	0.6750	0.6575	0.6407
4	0.7084	0.6830	0.6587	0.6355	0.6133	0.5921	0.5718	0.5523
5	0.6499	0.6209	0.5935	0.5674	0.5428	0.5194	0.4972	0.4761
6	0.5963	0.5645	0.5346	0.5066	0.4803	0.4556	0.4323	0.4104
7	0.5470	0.5132	0.4817	0.4523	0.4251	0.3996	0.3759	0.3538
8	0.5019	0.4665	0.4339	0.4039	0.3762	0.3506	0.3269	0.3050
9	0.4604	0.4241	0.3909	0.3606	0.3329	0.3075	0.2843	0.2630
10	0.4224	0.3855	0.3522	0.3220	0.2946	0.2697	0.2472	0.2267
11	0.3875	0.3505	0.3173	0.2875	0.2607	0.2366	0.2149	0.1954
12	0.3555	0.3186	0.2858	0.2567	0.2307	0.2076	0.1869	0.1685
13	0.3262	0.2897	0.2575	0.2292	0.2042	0.1821	0.1625	0.1452
14	0.2992	0.2633	0.2320	0.2046	0.1807	0.1597	0.1413	0.1252
15	0.2745	0.2394	0.2090	0.1827	0.1599	0.1401	0.1229	0.1079
16	0.2519	0.2176	0.1883	0.1631	0.1415	0.1229	0.1069	0.0930
17	0.2311	0.1978	0.1696	0.1456	0.1252	0.1078	0.0929	0.0802
18	0.2120	0.1799	0.1528	0.1300	0.1108	0.0946	0.0808	0.0691
19	0.1945	0.1635	0.1377	0.1161	0.0981	0.0829	0.0703	0.0596
20	0.1784	0.1486	0.1240	0.1037	0.0868	0.0728	0.0611	0.0514
21	0.1637	0.1351	0.1117	0.0926	0.0768	0.0638	0.0531	0.0443
22	0.1502	0.1228	0.1007	0.0826	0.0680	0.0560	0.0462	0.0382
23	0.1378	0.1117	0.0907	0.0738	0.0601	0.0491	0.0402	0.0329
24	0.1264	0.1015	0.0817	0.0659	0.0532	0.0431	0.0349	0.0284
25	0.1160	0.0923	0.0736	0.0588	0.0471	0.0378	0.0304	0.0245
26	0.1064	0.0839	0.0663	0.0525	0.0417	0.0331	0.0264	0.0211
27	0.0976	0.0763	0.0597	0.0469	0.0369	0.0291	0.0230	0.0182
28	0.0895	0.0693	0.0538	0.0419	0.0326	0.0255	0.0200	0.0157
29	0.0822	0.0630	0.0485	0.0374	0.0289	0.0224	0.0174	0.0135
30	0.0754	0.0573	0.0437	0.0334	0.0256	0.0196	0.0151	0.0116
31	0.0691	0.0521	0.0394	0.0298	0.0226	0.0172	0.0131	0.0100
32	0.0634	0.0474	0.0355	0.0266	0.0200	0.0151	0.0114	0.0087
33	0.0582	0.0431	0.0319	0.0238	0.0177	0.0132	0.0099	0.0075
34	0.0534	0.0391	0.0288	0.0212	0.0157	0.0116	0.0086	0.0064
35	0.0490	0.0356	0.0259	0.0189	0.0139	0.0102	0.0075	0.0055
36	0.0449	0.0323	0.0234	0.0169	0.0123	0.0089	0.0065	0.0048
37	0.0412	0.0294	0.0211	0.0151	0.0109	0.0078	0.0057	0.0041
38	0.0378	0.0267	0.0190	0.0135	0.0096	0.0069	0.0049	0.0036
39	0.0347	0.0243	0.0171	0.0120	0.0085	0.0060	0.0043	0.0031
40	0.0318	0.0221	0.0154	0.0107	0.0075	0.0053	0.0037	0.0026
41	0.0292	0.0201	0.0139	0.0096	0.0067	0.0046	0.0032	0.0023
42	0.0268	0.0183	0.0125	0.0086	0.0059	0.0041	0.0028	0.0020
43	0.0246	0.0166	0.0112	0.0076	0.0052	0.0036	0.0025	0.0017
44	0.0226	0.0151	0.0101	0.0068	0.0046	0.0031	0.0021	0.0015
45	0.0207	0.0137	0.0091	0.0061	0.0041	0.0027	0.0019	0.0013
46	0.0190	0.0125	0.0082	0.0054	0.0036	0.0024	0.0016	0.0011
47	0.0174	0.0113	0.0074	0.0049	0.0032	0.0021	0.0014	0.0009
48	0.0160	0.0103	0.0067	0.0043	0.0028	0.0019	0.0012	0.0008
49	0.0147	0.0094	0.0060	0.0039	0.0025	0.0016	0.0011	0.0007
50	0.0134	0.0085	0.0054	0.0035	0.0022	0.0014	0.0009	0.0006
51	0.0123	0.0077	0.0049	0.0031	0.0020	0.0013	0.0008	0.0005
52	0.0113	0.0070	0.0044	0.0028	0.0017	0.0011	0.0007	0.0004
53	0.0104	0.0064	0.0040	0.0025	0.0015	0.0010	0.0006	0.0004
54	0.0095	0.0058	0.0036	0.0022	0.0014	0.0008	0.0005	0.0003
55	0.0087	0.0053	0.0032	0.0020	0.0012	0.0007	0.0005	0.0003
56	0.0080	0.0048	0.0029	0.0018	0.0011	0.0007	0.0004	0.0002
57	0.0074	0.0044	0.0026	0.0016	0.0009	0.0006	0.0003	0.0002
58	0.0067	0.0040	0.0024	0.0014	0.0008	0.0005	0.0003	0.0002
59	0.0062	0.0036	0.002	0.0012	0.0007	0.0004	0.0003	0.0002
60	0.0057	0.0033	0.0019	0.0011	0.0007	0.0004	0.0002	0.0001