Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	ENGINEERING ECONOMY
COURSE CODE	:	BDA 40902
PROGRAMME CODE	:	BDD
EXAMINATION DATE	:	JULY 2022
EXAMINATION PERIOD	:	2 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS IN **SECTION A** 2. SELECT **ONE (1)** QUESTION FROM **TWO (2)** QUESTIONS PROVIDED IN **SECTION B** 3. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **CLOSED BOOK** 4. STUDENTS ARE PROHIBITED TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **TEN (10)** PAGES

SECTION A: Answer ALL questions

Q1 (a) Engineering economy analysis plays an important role in many situations. Describe **THREE (3)** situations in manufacturing process planning that require for such analysis.

(5 marks)

(b) SGBP Plantation Sdn Bhd plans to buy a new palm oil truck. There are **THREE (3)** alternative brands to be evaluated in terms of cost estimation as shown in **Table 1.** Given the MARR is 10% per annum. Noted that L3D represents the Last Three Digit of student matric number.

Table Q1(b): Palm oil truck

	TITAN	CIMC	ALIB
Capital Investment (RM)	58,000 + (100 x L3D)	61,000 + (100 x L3D)	67,000 + (100 x L3D)
Annual maintenance (RM)	3,000	2,000	1,000
Useful life (years)	5	10	10
Market Value (RM) (Disposal Cost)	30,000	15,000	17,000

(i) Draw cash-flow diagram for each truck.

(6 marks)

(ii) Apply the private project evaluation method to compare the annual worth (AW) for each truck.

(12 marks)

(iii) Justify which brand should be selected.

(2 marks)

Q2 (a) Identify each of the following cash flow to indicate whether it is a benefit, a disbenefit, or a cost.

(i) A project manager is constructing a large water dam but incurs a budget shortage. Hence he purchases less expensive turbines with a shorter maintenance cycle. The end result is less project cost, but higher operating cost.

(1 mark)

(ii) The project manager purchased less expensive turbines with a shorter maintenance cycle.

(1 mark)

(iii) Protect wetlands and introduce plant trees strategically is one way to prevent flash flood

(1 mark)

(iv) The replacement of brake pads that reaches the end of its useful life is part of a routine of maintaining a car.

(1 mark)

(v) Too much exposure to the UV light for skin treatment may well triggered the pigmentation of the skin.

(1 mark)

(b) The Pahang State Government is plan to provide a project to establish a large flood drainage culvert from the Chalet and RKT Homestay to Tasik Cini. The initial cost spent is RM 2,000,000 for the job and the cost and benefit items are shown in **Table Q2(b)**. The MARR is 6% per year, and the project's life is 30 years. Evaluate this project based on;

Table Q2(b): Cost and Benefit

Cost and Benefit Items	RM
Right of way maintenance	30,000 per year
Major upkeep every six years, starting at the present time	50,000
Annual benefit to the taxpayers	135,000

(i) Conventional PW B/C ratio

(14 marks)

(ii) Conventional AW B/C ratio

(6 marks)

Q3 (a) An asset which has a first cost of RM 40,000 is expected to have an annual operating cost of RM 15,000 per year. It will provide the needed service for a maximum of 6 years. If the salvage value changes as shown below, determine the economic life of the asset at 20% per year.

Table Q3(a)

Year	Salvage Value, RM
0	0
1	10,000
2	8,000
3	5,000
4	5,000
5	3,000

(10 marks)

(b) A furniture company intends to evaluate whether they want to stick with the existing equipment (defender) or replace them with the new productive equipment (challenger). The details of the cost required are shown in **Table Q3(b)** below. Use an interest rate of 20% per year.

Table Q3(b)

Items	Defender	Challenger
Initial cost eight (8) years ago (RM)	450,000	-
Market value (RM)	25,000	700,000
Yearly handling cost (RM)	160,000	70,000
Life time (year)	5	10
Salvage value (RM)	0	50,000

(i) Use the replacement analysis to justify whether the existing equipment is required to be replaced with the new equipment.

(10 marks)

(ii) If the existing equipment (defender) could be sold in international market, determine how much is the minimum value of the defender so that the challenger could replace the defender now?

(5 marks)

SECTION B: Answer ONE question only

Q4 (a) Identify each of the following cash items whether it is fixed cost, variable cost, sunk cost, opportunity cost or implicit cost.

(i) You spend RM 10,000 on the development of a new cell phone. Once the product is released, however, no consumers display an interest in purchasing your company's new cell phone

(1 mark)

(ii) Transaction fees associated with various payments needed to create a product or provide a service.

(1 mark)

(iii) The company incurs RM 550,000 in rental fees for its factory space.

(1 mark)

(iv) A commuter takes the train to work instead of driving.

(1 mark)

(v) Giving your workers a day off will lead to a drop in sales and income

(1 mark)

(b) I'm selling a product for RM15.00 per unit. My variable cost per unit is RM7.00. My fixed costs are RM9,000. Determine how many units do I have to sell to break even?

(4 marks)

(c) Blue Corp. shows monthly fixed costs of RM1,797 and per-unit cost of RM9.28. It sells 411 units in a month. Calculate what is the minimum price Blue Corp. must sell each unit for to break even?

(4 marks)

(d) Ahmad is thinking of chartering a bus to take people to an event in a large city. He is providing transportation, tickets to the event, and refreshments on the bus. He predicted the following expenses: Bus rental is RM80.00, event ticket costs RM12.50 per person, gas expense is RM75.00, and refreshment charge is RM7.50 per person. Other costs are fuels at RM20.00 and the bus driver allowance is at RM50.00.

(i) Calculate the total fixed costs and total variable costs.

(4 marks)

(ii) Determine a formula for the total cost and evaluate the potential possibilities to make money from the trip. Ahmad believes that he could attract 30 peoples at RM35.00 per ticket.

(5 marks)

(iii) Calculate the breakeven point

(3 marks)

Q5 (a) You are plan to invest RM (3,000 + 1,000 x L3D) in a digital company **ONE (1)** year from now. The investment provides return rate 6% per year compounded quarterly. Assume that you do not withdraw the money earned at the end of each year, but instead let it accumulate. Noted that L3D represents the Last Three Digit of student matric number

(i) Calculate the nominal interest rate per quarter

(4 marks)

(ii) Determine the effective interest rate per year

(4 marks)

(iii) From **Q5(a)(ii)**, compute the amount of investment after **THREE (3)** years.

(5 marks)

(b) Rahmat plans to withdraw his money RM 3,090 each year for five years, beginning at the 14th year. To keep his plan successful, he saves the money with the same amount each year.

(i) Draw a cash flow to represent the flow of saving and withdrawing of the money.

(3 marks)

(ii) Calculate how much money should he deposits each year for 12 years, starting from the first year. Assume the interest is 8% per year.

(9 marks)

- END OF QUESTION –

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LIST OF FORMULA

1	TC = FC + VC(Q)	9	Conventional B-C ratio with PW B-C = PW(B) ÷ [(I – PW(MV)) +PW(O&M)]
2	TR = P x Q	10	Conventional B-C ratio with AW B-C = AW(B) ÷ [CR + AW(O&M)]
3	$I_{effective} = \left(1 + \frac{r}{m}\right)^m - 1$	11	Modified B-C ratio with PW B-C = [PW(B) – PW(O&M)] ÷ [I – PW(MV)]
4	$p\,(1+i)^n$	12	Modified B-C ratio with PW B-C = [AW(B) – AW(O&M)] ÷ CR
5	$F = P\left(\frac{F}{P}, i, n\right) = P(1+i)^n$	13	$P = F\left(\frac{P}{F}, i, n\right) = F\left[\frac{1}{(1+i)^n}\right]$
6	$F = A\left(\frac{F}{A}, i, n\right) = A\left[\frac{(1+i)^n - 1}{i}\right]$	14	$A = F\left(\frac{A}{F}, i, n\right) = F\left[\frac{i}{(1+i)^n - 1}\right]$
7	$P = A\left(\frac{P}{A}, i, n\right) = A\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$	15	$A = P\left(\frac{A}{P}, i, n\right) = P\left[\frac{i(1+i)^n}{(1+i)^n - 1}\right]$
8	$CR_k = -P(A/P, i, k) + S_k(A/F, i, k)$	16	$AW_k = - CR_k - AOC$

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INTEREST TABLE

6.0% Compound Interest Factors 6.0%

	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	1.0600	0.9434	1.0000	1.0600	1.0000	0.943	0.000	0.000	1
2	1.1236	0.8900	0.4854	0.5454	2.060	1.833	0.485	0.890	2
3	1.1910	0.8396	0.3141	0.3741	3.184	2.673	0.961	2.569	3
4	1.2625	0.7921	0.2286	0.2886	4.375	3.465	1.427	4.946	4
5	1.3382	0.7473	0.1774	0.2374	5.637	4.212	1.884	7.935	5
6	1.4185	0.7050	0.1434	0.2034	6.975	4.917	2.330	11.459	6
7	1.5036	0.6651	0.1191	0.1791	8.394	5.582	2.768	15.450	7
8	1.5938	0.6274	0.1010	0.1610	9.897	6.210	3.195	19.842	8
9	1.6895	0.5919	0.0870	0.1470	11.491	6.802	3.613	24.577	9
10	1.7908	0.5584	0.0759	0.1359	13.181	7.360	4.022	29.602	10
11	1.8983	0.5268	0.0668	0.1268	14.972	7.887	4.421	34.870	11
12	2.0122	0.4970	0.0593	0.1193	16.870	8.384	4.811	40.337	12
13	2.1329	0.4688	0.0530	0.1130	18.882	8.853	5.192	45.963	13
14	2.2609	0.4423	0.0476	0.1076	21.015	9.295	5.564	51.713	14
15	2.3966	0.4173	0.0430	0.1030	23.276	9.712	5.926	57.555	15
16	2.5404	0.3936	0.0390	0.0990	25.673	10.106	6.279	63.459	16
17	2.6928	0.3714	0.0354	0.0954	28.213	10.477	6.624	69.401	17
18	2.8543	0.3503	0.0324	0.0924	30.906	10.828	6.960	75.357	18
19	3.0256	0.3305	0.0296	0.0896	33.760	11.158	7.287	81.306	19
20	3.2071	0.3118	0.0272	0.0872	36.786	11.470	7.605	87.230	20
21	3.3996	0.2942	0.0250	0.0850	39.993	11.764	7.915	93.114	21
22	3.6035	0.2775	0.0230	0.0830	43.392	12.042	8.217	98.941	22
23	3.8197	0.2618	0.0213	0.0813	46.996	12.303	8.510	104.701	23
24	4.0489	0.2470	0.0197	0.0797	50.816	12.550	8.795	110.381	24
25	4.2919	0.2330	0.0182	0.0782	54.865	12.783	9.072	115.973	25

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8.0% Compound Interest Factors 8.0%

	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	1.0800	0.9259	1.0000	1.0800	1.0000	0.926	0.000	0.000	1
2	1.1664	0.8573	0.4808	0.5608	2.080	1.783	0.481	0.857	2
3	1.2597	0.7938	0.3080	0.3880	3.246	2.577	0.949	2.445	3
4	1.3605	0.7350	0.2219	0.3019	4.506	3.312	1.404	4.650	4
5	1.4693	0.6806	0.1705	0.2505	5.867	3.993	1.846	7.372	5
6	1.5869	0.6302	0.1363	0.2163	7.336	4.623	2.276	10.523	6
7	1.7138	0.5835	0.1121	0.1921	8.923	5.206	2.694	14.024	7
8	1.8509	0.5403	0.0940	0.1740	10.637	5.747	3.099	17.806	8
9	1.9990	0.5002	0.0801	0.1601	12.488	6.247	3.491	21.808	9
10	2.1589	0.4632	0.0690	0.1490	14.487	6.710	3.871	25.977	10
11	2.3316	0.4289	0.0601	0.1401	16.645	7.139	4.240	30.266	11
12	2.5182	0.3971	0.0527	0.1327	18.977	7.536	4.596	34.634	12
13	2.7196	0.3677	0.0465	0.1265	21.495	7.904	4.940	39.046	13
14	2.9372	0.3405	0.0413	0.1213	24.215	8.244	5.273	43.472	14
15	3.1722	0.3152	0.0368	0.1168	27.152	8.559	5.594	47.886	15
16	3.4259	0.2919	0.0330	0.1130	30.324	8.851	5.905	52.264	16
17	3.7000	0.2703	0.0296	0.1096	33.750	9.122	6.204	56.588	17
18	3.9960	0.2502	0.0267	0.1067	37.450	9.372	6.492	60.843	18
19	4.3157	0.2317	0.0241	0.1041	41.446	9.604	6.770	65.013	19
20	4.6610	0.2145	0.0219	0.1019	45.762	9.818	7.037	69.090	20
21	5.0338	0.1987	0.0198	0.0998	50.423	10.017	7.294	73.063	21
22	5.4365	0.1839	0.0180	0.0980	55.457	10.201	7.541	76.926	22
23	5.8715	0.1703	0.0164	0.0964	60.893	10.371	7.779	80.673	23
24	6.3412	0.1577	0.0150	0.0950	66.765	10.529	8.007	84.300	24
25	6.8485	0.1460	0.0137	0.0937	73.106	10.675	8.225	87.804	25

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10% Compound Interest Factors 10%

	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	1.1000	0.9091	1.0000	1.1000	1.0000	0.909	0.000	0.000	1
2	1.2100	0.8264	0.4762	0.5762	2.100	1.736	0.476	0.826	2
3	1.3310	0.7513	0.3021	0.4021	3.310	2.487	0.937	2.329	3
4	1.4641	0.6830	0.2155	0.3155	4.641	3.170	1.381	4.378	4
5	1.6105	0.6209	0.1638	0.2638	6.105	3.791	1.810	6.862	5
6	1.7716	0.5645	0.1296	0.2296	7.716	4.355	2.224	9.684	6
7	1.9487	0.5132	0.1054	0.2054	9.487	4.868	2.622	12.763	7
8	2.1436	0.4665	0.0874	0.1874	11.436	5.335	3.004	16.029	8
9	2.3579	0.4241	0.0736	0.1736	13.579	5.759	3.372	19.421	9
10	2.5937	0.3855	0.0627	0.1627	15.937	6.145	3.725	22.891	10
11	2.8531	0.3505	0.0540	0.1540	18.531	6.495	4.064	26.396	11
12	3.1384	0.3186	0.0468	0.1468	21.384	6.814	4.388	29.901	12
13	3.4523	0.2897	0.0408	0.1408	24.523	7.103	4.699	33.377	13
14	3.7975	0.2633	0.0357	0.1357	27.975	7.367	4.996	36.800	14
15	4.1772	0.2394	0.0315	0.1315	31.772	7.606	5.279	40.152	15
16	4.5950	0.2176	0.0278	0.1278	35.950	7.824	5.549	43.416	16
17	5.0545	0.1978	0.0247	0.1247	40.545	8.022	5.807	46.582	17
18	5.5599	0.1799	0.0219	0.1219	45.599	8.201	6.053	49.640	18
19	6.1159	0.1635	0.0195	0.1195	51.159	8.365	6.286	52.583	19
20	6.7275	0.1486	0.0175	0.1175	57.275	8.514	6.508	55.407	20
21	7.4002	0.1351	0.0156	0.1156	64.002	8.649	6.719	58.110	21
22	8.1403	0.1228	0.0140	0.1140	71.403	8.772	6.919	60.689	22
23	8.9543	0.1117	0.0126	0.1126	79.543	8.883	7.108	63.146	23
24	9.8497	0.1015	0.0113	0.1113	88.497	8.985	7.288	65.481	24
25	10.835	0.0923	0.0102	0.1102	98.347	9.077	7.458	67.696	25

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20% Compound Interest Factors 20%

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	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*	Find *P*	Find *A*	Find *A*	Find *F*	Find *P*	Find *A*	Find *P*	
	Given *P*	Given *F*	Given *F*	Given *P*	Given *A*	Given *A*	Given *G*	Given *G*	
n	***F/P***	***P/F***	***A/F***	***A/P***	***F/A***	***P/A***	***A/G***	***P/G***	n
1	1.2000	0.8333	1.0000	1.2000	1.0000	0.833	0.000	0.000	1
2	1.4400	0.6944	0.4545	0.6545	2.200	1.528	0.455	0.694	2
3	1.7280	0.5787	0.2747	0.4747	3.640	2.106	0.879	1.852	3
4	2.0736	0.4823	0.1863	0.3863	5.368	2.589	1.274	3.299	4
5	2.4883	0.4019	0.1344	0.3344	7.442	2.991	1.641	4.906	5
6	2.9860	0.3349	0.1007	0.3007	9.930	3.326	1.979	6.581	6
7	3.5832	0.2791	0.0774	0.2774	12.916	3.605	2.290	8.255	7
8	4.2998	0.2326	0.0606	0.2606	16.499	3.837	2.576	9.883	8
9	5.1598	0.1938	0.0481	0.2481	20.799	4.031	2.836	11.434	9
10	6.1917	0.1615	0.0385	0.2385	25.959	4.192	3.074	12.887	10
11	7.4301	0.1346	0.0311	0.2311	32.150	4.327	3.289	14.233	11
12	8.9161	0.1122	0.0253	0.2253	39.581	4.439	3.484	15.467	12
13	10.699	0.0935	0.0206	0.2206	48.497	4.533	3.660	16.588	13
14	12.839	0.0779	0.0169	0.2169	59.196	4.611	3.817	17.601	14
15	15.407	0.0649	0.0139	0.2139	72.035	4.675	3.959	18.509	15
16	18.488	0.0541	0.0114	0.2114	87.442	4.730	4.085	19.321	16
17	22.186	0.0451	0.0094	0.2094	105.931	4.775	4.198	20.042	17
18	26.623	0.0376	0.0078	0.2078	128.117	4.812	4.298	20.680	18
19	31.948	0.0313	0.0065	0.2065	154.740	4.843	4.386	21.244	19
20	38.338	0.0261	0.0054	0.2054	186.688	4.870	4.464	21.739	20
21	46.005	0.0217	0.0044	0.2044	225.026	4.891	4.533	22.174	21
22	55.206	0.0181	0.0037	0.2037	271.031	4.909	4.594	22.555	22
23	66.247	0.0151	0.0031	0.2031	326.237	4.925	4.647	22.887	23
24	79.497	0.0126	0.0025	0.2025	392.484	4.937	4.694	23.176	24
25	95.396	0.0105	0.0021	0.2021	471.981	4.948	4.735	23.428	25