UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023

COURSE NAME	:	ENGINEERING ECONOMY
COURSE CODE	:	BNR 36502
PROGRAMME CODE	:	BND/BNE/ BNF
EXAMINATION DATE	:	FEBRUARY 2023
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	1. ANSWER ALL QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**. 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) State clearly the engineering economic analysis procedure.

(6 marks)

(b) Briefly explain the following type of cost:

(i) Incremental Cost
(ii) Disposal Cost
(iii) Sunk Cost
(iv) Cash Cost
(v) Opportunity Cost

(10 marks)

(c) Ali borrowed money of RM 130,000 from a bank in order to start a business. The bank loan interest is at 10% per annum. Calculate the amount of your debt at the end of the fifth year according to the calculation of both types of simple interest and compound interest.

(9 marks)

Q2 (a) Henry Ford's Model T was originally designed and built to run on ethanol. Today, ethanol (190-proof alcohol) can be produced with domestic stills for about $0.85 per gallon. When blended with gasoline costing $4.00 per gallon, a 20% ethanol and 80% gasoline mixture costs $3.37 per gallon. Assume fuel consumption at 25 mpg and engine performance in general are not adversely affected with this 20–80 blend (called E20).

(i) Compute the money that can be saved for 15,000 miles of driving per year.

(7 marks)

(ii) Calculate how much gasoline per year is being converted if one million people use the E20 fuel?

(6 marks)

(b) A company produces air conditions that is used in consumer and commercial products. The fixed cost (CF) is $63,000 per month, and the variable cost (cv) is $73 per unit. The selling price per unit is $p = \$190 - 0.03(D)$.

(i) Compute the optimal volume for this product and confirm that a profit or loss occurs at this demand.

(7 marks)

(ii) Calculate the volumes at which breakeven occurs through the range of profitable demand.

(5 marks)

Q3 (a) A new machine is proposed by a leading consulting company to upgrade the power quality measurement at PQ meters. The investment cost is RM 45,000 with salvage value of RM 5,000 after 5 years. The revenue generated from the installation of the equipment minus the operating and maintenance cost of the equipment is RM 7,500 per year. The MARR is 15% per year. Draw the cash flow diagram.

(6 marks)

(b) A remotely located air sampling station can be powered by solar cells or by running an above ground electric line to the site and using conventional power. Solar cells will cost RM 15,000 to install and will have a useful life of 5 years with no salvage value. Annual costs for inspection, cleaning, maintenance and part replacement are expected to be RM 4,000. A new power line will cost RM 40,000 to install, with power costs expected to be RM 1,000 per year. Since the air sampling project will end in 10 years, the salvage value of the line is considered to be zero. At an interest rate of 6% per year compounded monthly,

(i) Calculate the effective interest rate per year.

(6 marks)

(ii) Determine which alternative should be selected on the basis of a present worth analysis.

(13 marks)

Q4 (a) A construction Corporation is considering a new project to construct a new jetty near Forest City, Johor Bahru, for the use of gateway tourism's ferry to and from Singapore and Indonesia. Also included in the project is to build custom and immigration facilities. The land acquisition is estimated to be RM1.2 million. Construction cost for the jetty and other facilities is expected to be RM1.8 million with an additional annual maintenance cost of RM 90,000. Finally, the projected increase in marina travelers will require an additional jetty traffic controller with an annual cost of RM50,000. Market value of some assets at the end of useful life is estimated RM20,000. Annual benefits of the jetty has been estimated as in **Table Q4 (a)**. The study period of this proposed project is for 10 years with the MARR of 15% per year.

(i) Calculate the conventional B-C ratio with PW

(12 marks)

(ii) Compute the modified B-C ratio with PW

(12 marks)

(iii) Whether the project should be continued or not?

(1 mark)

- END OF QUESTIONS –

Appendix (Interest Table)

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Years, n	Discrete Compounding; i = 6%					
Factor	Compound Amount Factor	Present Worth Factor	Compound Amount Factor	Present Worth Factor	Sinking Fund Factor	Capital Recovery Factor
Formula	$F/P = (1+i)^n$	$\frac{P}{F} = \frac{1}{(1+i)^n}$	$\frac{F}{A} = \left[\frac{(1+i)^n - 1}{i}\right]$	$\frac{P}{A} = \left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$	$\frac{A}{F} = \left[\frac{i}{(1+i)^n - 1}\right]$	$\frac{A}{P} = \left[\frac{i(1+i)^n}{(1+i)^n - 1}\right]$
Symbol	(F/P)	P/F	F/A	P/A	A/F	A/P
1	1.0600	0.9434	1.0000	0.9434	1.0000	1.0600
2	1.1236	0.8900	2.0600	1.8334	0.4854	0.5454
3	1.1910	0.8396	3.1836	2.6730	0.3141	0.3741
4	1.2625	0.7921	4.3746	3.4651	0.2286	0.2886
5	1.3382	0.7473	5.6371	4.2124	0.1774	0.2374
6	1.4185	0.7050	6.9753	4.9173	0.1434	0.2034
7	1.5036	0.6651	8.3938	5.5824	0.1191	0.1791
8	1.5938	0.6274	9.8975	6.2098	0.1010	0.1610
9	1.6895	0.5919	11.4913	6.8017	0.0870	0.1470
10	1.7908	0.5584	13.1808	7.3601	0.0759	0.1359
11	1.8983	0.5268	14.9716	7.8869	0.0668	0.1268
12	2.0122	0.4970	16.8699	8.3838	0.0593	0.1193
13	2.1329	0.4688	18.8821	8.8527	0.0530	0.1130
14	2.2609	0.4423	21.0151	9.2950	0.0476	0.1076
15	2.3966	0.4173	23.2760	9.7122	0.0430	0.1030
16	2.5404	0.3936	25.6725	10.1059	0.0390	0.0990
17	2.6928	0.3714	28.2129	10.4773	0.0354	0.0954
18	2.8543	0.3503	30.9057	10.8276	0.0324	0.0924
19	3.0256	0.3305	33.7600	11.1581	0.0296	0.0896
20	3.2071	0.3118	36.7856	11.4699	0.0272	0.0872
21	3.3996	0.2942	39.9927	11.7641	0.0250	0.0850
22	3.6035	0.2775	43.3923	12.0416	0.0230	0.0830
23	3.8197	0.2618	46.9958	12.3034	0.0213	0.0813
24	4.0489	0.2470	50.8156	12.5504	0.0197	0.0797
25	4.2919	0.2330	54.8645	12.7834	0.0182	0.0782
26	4.5494	0.2198	59.1564	13.0032	0.0169	0.0769
27	4.8223	0.2074	63.7058	13.2105	0.0157	0.0757
28	5.1117	0.1956	68.5281	13.4062	0.0146	0.0746
29	5.4184	0.1846	73.6398	13.5907	0.0136	0.0736
30	5.7435	0.1741	79.0582	13.7648	0.0126	0.0726
31	6.0881	0.1643	84.8017	13.9291	0.0118	0.0718
32	6.4534	0.1550	90.8898	14.0840	0.0110	0.0710
33	6.8406	0.1462	97.3432	14.2302	0.0103	0.0703
34	7.2510	0.1379	104.1838	14.3681	0.0096	0.0696
35	7.6861	0.1301	111.4348	14.4982	0.0090	0.0690
36	8.1473	0.1227	119.1209	14.6210	0.0084	0.0684
37	8.6361	0.1158	127.2681	14.7368	0.0079	0.0679
38	9.1543	0.1092	135.9042	14.8460	0.0074	0.0674
39	9.7035	0.1031	145.0585	14.9491	0.0069	0.0669
40	10.2857	0.0972	154.7620	15.0463	0.0065	0.0665

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Table Q4 (a)

Annual Benefits	**RM**
Rental receipts from ferry & boats	300,000
Jetty charges to passengers	240,000
Convenience benefit to the local community	60,000
Additional tourism income to state of Johor	120,000