UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME : ENGINEERING ECONOMY

COURSE CODE : BNJ 30902

PROGRAMME : BNG / BNM

EXAMINATION DATE : DECEMBER 2019 / JANUARY 2020

DURATION : 2 HOURS

INSTRUCTION : ANSWER **ALL** QUESTIONS

TERBUKA

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES ONLY

Q1   (a)   Define **FOUR (4)** principles of engineering economy.

(3 marks)

(b)   Explain **FOUR (4)** ways to increase the efficiency during searching for potential alternatives in engineering economy.

(4 marks)

(c)   Performance monitoring and post evaluation of results should be made after evaluating all the alternatives. Point out **THREE (3)** plans for monitoring project performance.

(4 marks)

(d)   Two currently owned machines by EON Auto Mart Sdn Bhd are being considered for the production of a new part for car bumper. The capital investment associated with both machines are about the same. The important differences between the machines are their production capacities and their rejection rate shown in **Table Q1 (d)**. The material cost is RM 8.00 per part, and all defect-free parts produced can be sold for RM 15.00 each. The operator cost is RM 20.00 per hour and the variable overhead rate for traceable cost is RM 7.00 per hour for both machines.

(i)   Calculate the profit for Machine A.

(4 marks)

(ii)   Calculate the profit for Machine B.

(4 marks)

(iii)   Determine the maximum percentage of rejected part produced by Machine B to be as profitable as Machine A.

(6 marks)

Q2   (a)   Distinguish both functional work elements and physical work elements in work breakdown structure (WBS).

(4 marks)

(b)   Give **FOUR (4)** sources of estimating data in estimating techniques in engineering economy.

(4 marks)

(c)   Last year of 2017, a 100 MW Generator set costs RM140,000. The cost index for this genset in year 2017 was 180 and now is 195. The cost-capacity factor is 0.7.

(i)   The engineer is considering new genset with 150 MW to replace the old unit. Additional features of this genset for longer duration would costs RM20,000. Determine the total cost of the 150 MW unit.

(3 marks)

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(ii) Estimate the cost of a 50 MW unit of the same design including RM20,000 for the cost of additional features.

(4 marks)

(d) The Safran Company needs 40,000 hours to produce the first unit of an aircraft engine while the next second unit production needs up to 32,000 hours. Additionally, the estimated labour cost is RM50/hour.

Compute the following using logarithmic model:

(i) The time to produce the 8th unit and its labor cost.

(3 marks)

(ii) Estimate the total labor to produce the 8th unit.

(3 marks)

(iii) Determine the cumulative average number of labor hours per unit for the first 6 units.

(4 marks)

Q3 (a) Mr. Razi is planning for his son, Rashid's education. He is planning to send Rashid to do engineering in UTHM when the time comes. Based on his current planning, he has 10 years to save a lump-sum amount for Rashid's college education. He also had done some research on the current year fees and he found that for four year education, it will cost him RM75,000 and this is expected to increase by 10% per year into the foreseeable future.

(i) Compute the total cost of Rashid's education based on his four-year education with 10% increment per year.

(3 marks)

(ii) Determine the amount Mr. Razi must save each year for 10 years if he invests in a highly rated tax free municipal bond that earns 6% per year, so that he could afford Rashid's education.

(3 marks)

(iii) Draw the cash flow time lines from Mr. Razi's point of view for **Q3(a)(i)** and **Q3(a)(ii).**

(6 marks)

(iv) Assume UTHM "freeze" the cost of education in 10 years for a lump-sum of current value RM150,000. Explain whether the investment in Rashid's education is a good deal.

(2 marks)

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(b) Rashid has finally finished his degree from UTHM and now is leading a happy life with his own family. At the age of 50, he has been appointed as the Regional Manager of the company he is working on at the moment. To celebrate his achievement, he plans to open a saving account and able to save up to RM22,000 per year. His starting balance is RM200,000 and he saves the full amount of money available to him.

(i) Compute the total cost of Rashid's education based on his four year education with 10% increment per year.

(6 marks)

(ii) Draw the cash flow time lines in accordance to Rashid's situation above.

(5 marks)

Q4 Rentaka Corporation is considering a new project to construct a new ferry terminal near Tg.Emas, Muar. This ferry terminal will be used to be a gateway tourism's ferry to and from Indonesia. This project is including the construction of custom and immigration facilities. The land acquisition is expected to be RM 2.5 million. Construction cost for the ferry terminal and other facilities is expected to be RM 4.5 million with an additional annual maintenance cost of RM200,000. This project also have an additional ferry terminal traffic controller with an annual cost of RM 100,000. Market value of some assets at the end of useful life is estimated RM 50,000. Annual benefits of the ferry terminal has been estimated as in **Table Q4**. The study period of this proposed project is for 10 years with the MARR of 15% per year.

(a) Calculate the conventional Benefit-Cost (B-C) ratio with the Present Worth (PW) method.

(5 marks)

(b) Calculate the modified Benefit-Cost (B-C) ratio with the Present Worth (PW) method.

(5 marks)

(c) Calculate the conventional Benefit-Cost (B-C) ratio with the Annual Worth (AW)

(5 marks)

(d) Calculate the modified Benefit-Cost (B-C) ratio with the Annual Worth (AW) method.

(5 marks)

(e) Justify accordingly to the each Benefit-Cost (B-C) ratio evaluation method for **Q4 (a)** up to **Q4 (d)** whether the project should be proceeded or not.

(5 marks)

- **END OF QUESTIONS** –

Table Q1 (d)

Criteria	Machine A	Machine B
Production rate	200 parts / hour	250 parts / hour
Hours available for production	7 hours / day	6 hours / day
Percent parts rejected	5%	15%

Table Q4

Annual Benefits	Price (RM)
Rental receipts from ferry	400,000
Ferry terminal charges to passengers	300,000
Convenience benefit to the local community	100,000
Additional tourism income to state of Johor	150,000

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LIST OF FORMULA

1.	$C_n = C_k \left(\dfrac{\bar{I}_n}{\bar{I}_k} \right)$
2.	$\dfrac{C_A}{C_B} = \left(\dfrac{S_A}{S_B} \right)^x$
3.	$Z_u = K(u^n)$
4.	$T_x = K \displaystyle\sum_{u=1}^{x} u^n$
5.	$\bar{I}_n = \dfrac{W_1(C_{n1}/C_{k1}) + W_2(C_{n2}/C_{k2}) + \cdots + W_M(C_{nM}/C_{kM})}{W_1 + W_2 + \cdots + W_M} \times \bar{I}_k$
6.	$B - C = \dfrac{PW(B)}{I - PW(MV) + PW(O\&M)}$
7.	$B - C = \dfrac{PW(B) - PW(O\&M)}{I - PW(MV)}$
8.	$B - C = \dfrac{AW(B)}{CR + AW(O\&M)}$
9.	$B - C = \dfrac{AW(B) - AW(O\&M)}{CR}$

LIST OF DISCRETE COMPOUNDING

1. (F/P, 5%, 4)   :   1.2155
2. (P/F, 5%, 4)   :   0.8227
3. (F/A, 5%, 4)   :   4.3101
4. (P/A, 5%, 4)   :   3.5460
5. (A/F, 5%, 4)   :   0.2320
6. (A/P, 5%, 4)   :   0.2820
7. (P/G, 5%, 4)   :   5.103
8. (A/G, 5%, 4)   :   1.4391
9. (F/P, 5%, 10) :   1.6289
10. (F/P, 5%, 10) :   1.6289
11. (P/F, 5%, 10) :   0.6139
12. (F/A, 5%, 10) :   12.5779

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13.	(A/G, 6%, 10)	:	4.0220
14.	(F/P, 6%, 20)	:	3.2071
15.	(P/F, 6%, 20)	:	0.3118
16.	(F/A, 6%, 20)	:	36.7856
17.	(P/A, 6%, 20)	:	11.4699
18.	(A/F, 6%, 20)	:	0.0272
19.	(A/P, 6%, 20)	:	0.0872
20.	(P/G, 6%, 20)	:	87.230
21.	(A/G, 6%, 20)	:	7.6051
22.	(F/P, 7%, 15)	:	2.7590
23.	(P/F, 7%, 15)	:	0.3624
24.	(F/A, 7%, 15)	:	25.1290
25.	(P/A, 7%, 15)	:	9.1079
26.	(A/F, 7%, 15)	:	0.0398
27.	(A/P, 7%, 15)	:	0.1098
28.	(P/G, 7%, 15)	:	52.446
29.	(A/G, 7%, 15)	:	5.7583
30.	(F/P, 10%, 10)	:	2.5937
31.	(P/F, 10%, 10)	:	0.3855
32.	(F/A, 10%, 10)	:	15.9374
33.	(P/A, 10%, 10)	:	6.1446
34.	(A/F, 10%, 10)	:	0.0627
35.	(A/P, 10%, 10)	:	0.1627
36.	(P/G, 10%, 10)	:	22.891
37.	(A/G, 10%, 10)	:	3.7255
38.	(A/G, 6%, 10)	:	4.0220
39.	(F/P, 6%, 20)	:	3.2071
40.	(P/F, 6%, 20)	:	0.3118
41.	(F/A, 6%, 20)	:	36.7856
42.	(P/A, 6%, 20)	:	11.4699
43.	(A/F, 6%, 20)	:	0.0272
44.	(A/P, 6%, 20)	:	0.0872
45.	(P/G, 6%, 20)	:	87.230
46.	(A/G, 6%, 20)	:	7.6051
47.	(F/P, 7%, 15)	:	2.7590
48.	(P/F, 7%, 15)	:	0.3624
49.	(F/A, 7%, 15)	:	25.1290