UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2019/2020

COURSE NAME	:	ENGINEERING ECONOMY
COURSE CODE	:	BFC 44602 / BPK 30902
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2020
DURATION	:	4 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

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Q1 (a) Identify each of the following cash items whether it is fixed cost, variable cost, sunk cost, or opportunity cost.

(i) Total of RM25,000 income forgone by an engineering student that choose to further their study

(1 mark)

(ii) RM4000 monthly rental cost for a site office and the equipments.

(1 mark)

(iii) The cost of RM10 000 for land acquisation of building a water tank with **TWO (2)** options of materials

(1 mark)

(iv) Total cost of RM245,000 for labours and materials in the construction site.

(1 mark)

(b) JohorBina is a contractor company specialise in bridge construction. The company has been offered two projects to construct a bridge at two different locations. However, based on the capability of the company, the company is only able to accept one project at a time. To make the decision, cost estimation has to be conducted first. The cost factors relating to the two projects are shown in **Table Q1(b)**.

The design phase for both projects will take 3 months and the construction phase will take 9 months. Thus total of 12 months are required to complete the project (With 6 working days per week and 8 working hours per day). The volume for each beam and column are 500m^3 and 314m^3 respectively. The cost of concrete is RM65 per unit volume. The revenue for the bridge construction comes from the toll payment by the users of the bridge. The fees for each automobile that passes through the bridge is RM1.10 per automobile on average. The average number of automobile passes through the bridge is 60 000 per year.

TABLE Q1(b)

Cost Factors	Project A	Project B
Concrete beams and columns needed	6 beams, 12 columns	8 beams, 16 columns
Equipment rental (per month)	RM1000	RM2500
Site investigation	RM40636	RM30848
Labour cost:		
(i) Design engineer	RM150 per hour	RM130 per hour
(ii) Field/construction engineer	RM100 per hour	RM90 per hour

(i) Calculate the cost of material for each project.

(4 marks)

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(ii)   Calculate the cost of labour for each project

(8 marks)

(iii)   Compute the total cost for both projects

(6 marks)

(iv)   Choose the best project and justify your decision

(3 marks)

Q2   Precast Manufacturing Sdn. Bhd launches a new precast concrete product. The information on their product is shown in **Table Q2**. Their competitor, Mega Jaya Sdn. Bhd. offers a similar product at RM 2,500 per unit. An 87% learning curve applies to the labour required and it take 12 hours to complete the first unit. For cost estimation purposes, Precast Manufacturing Sdn. Bhd. decides to use time for completing the 15th unit as a standard. The profit margin is based on total manufacturing costs.

TABLE Q2

Directory labour cost	RM 65.00/ hour
Factory overhead	115 % of direct labour
Production materials	RM 1115/unit

(i)   Determine the maximum profit margin that Precast Manufacturing Sdn. Bhd. can have to remain competitive.

(12 marks)

(ii)   Compute the number of units that must be sold to achieve a profit of RM 45,000 if the selling price of product is RM 2750.

(6 marks)

(iii)   Determine the cumulative average hours required for the first fifteen units.

(7 marks)

Q3 (a) Farid is planning to open up his contractor firm in 10 years. Based on this year's research, he needs a total of RM 75000 to start the firm and the amount would increase each year at 10% interest rate. He does not plan to apply for any loan but to use his own money. For the time being, he is working with a private company as a technician and he planned to save some of his monthly salary to fulfill his dream.

(i)   Calculate the cost of Farid's new firm after ten years

(6 marks)

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(ii)   Farid is planning to put his saving for the firm into Tabung Haji. He had to sign up for a new account where he would earn 6% per year continuosusly for each amount he saved. Calculate how much he should save each year for the next 10 years to ensure he has enough money to start his firm

(6 marks)

(iii)   If Farid's monthly income is RM2000 per month and remain the same for 10 years. Explain whether his plan to have his own contractor firm would become reality

(3 marks)

(b)   Farid has finally opened up his contractor firm and his business is doing excellently successful. He is currently having 10 different branches all over Malaysia. At the age of 50, he started to think about his retirement plan and would like to open a special account to cater for his retirement. He opens another account in Tabung Haji and deposited an amount of RM 200,000 as his opening balance. He plans to save up to RM22,000 per year into his second account in Tabung Haji.

Calculate the amount of money he will have saved when he is 65 years old, after 15 years of savings with the interest rate of 7% per year.

(10 marks)

Q4   (a)   The cost of grading and spreading gravel on a short rural road is expected to be RM 300,000. The road will have to be maintained at a cost of RM 25,000 per year. Even though the new road is not very smooth, it allows access to an area that previously could only be reached with off-road vehicles. The improved accessibility has led to a 150% increase in the property values along the road.

(i)   Calculate the conventional B/C ratio with PW using an interest rate of 6% per year and a 20-year study period if the previous market value of a property was RM 900,000. Justify whether the project should be proceeded or not

(11 marks)

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(b)   (i)   Muthu Construction Works has been offered a tender to install an escalator in MARA Building at Kulai, Johor. The company has two alternatives with details as shown in the **TABLE Q4(b).** Choose the best alternative for the company using Present Worth (PW) method if the interest is 12% compounded every quarter year. Your answer should include cash flow diagrams for each alternative and solved by either the formula or table. Based on your answer, which alternative should be selected? Give your rationale for the choice.

TABLE 4Q(b)

Information	Alternative X (RM)	Alternative Y (RM)
First Cost	55000	85000
Operational Cost (every 3 months)	15000	3000
Salvage Value	5000	8500
Lifetime, year	2	4

(14 marks)

- **END OF QUESTIONS -**

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LIST OF FORMULA

1. $p(1+i)^n$
2. $C_n = C_k (I_n/I_k)$
3. $Z_u = K(1/1^n)$
4. $n = \log s / \log 2$
5. $I_n = \dfrac{W1 (C_{n1}/C_{k2}) + W2 (C_{n2}/C_{k2}) + W\ldots (C_{n\ldots}/C_{k\ldots})}{W1 + W2 + W\ldots\ldots} \times I_k$
6. Conventional B-C ratio with PW
   B-C = PW(B) ÷ [(I − PW(MV)) + PW(O&M)]
7. Modified B-C ratio with PW
   B-C = [PW(B) − PW(O&M)] ÷ [I − PW(MV)]
8. Conventional B-C ratio with AW
   B-C = AW(B) ÷ [CR + AW(O&M)]
9. Modified B-C ratio with AW
   B-C = [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. (P/F. 5%. 10) : 0.6139
11. (F/A. 5%. 10) : 12.5779
12. (P/A. 5%. 10) : 7.7217
13. (A/F. 5%. 10) : 0.0795
14. (A/P. 5%. 10) : 0.1295
15. (P/G. 5%. 10) : 31.652
16. (A/G. 5%. 10) : 4.0991
17. (F/P. 6%. 10) : 1.7908
18. (P/F. 6%. 10) : 0.5584
19. (F/A. 6%. 10) : 13.1808
20. (P/A. 6%. 10) : 7.3601
21. (A/F. 6%. 10) : 0.0759
22. (A/P. 6%. 10) : 0.1359
23. (P/G. 6%. 10) : 29.602

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ECONOMY

LIST OF DISCRETE COMPOUNDING

No.	Factor		Value
24.	(A/G, 6%, 10)	:	4.0220
25.	(F/P, 6%, 20)	:	3.2071
26.	(P/F, 6%, 20)	:	0.3118
27.	(F/A, 6%, 20)	:	36.7856
28.	(P/A, 6%, 20)	:	11.4699
29.	(A/F, 6%, 20)	:	0.0272
30.	(A/P, 6%, 20)	:	0.0872
31.	(P/G, 6%, 20)	:	87.230
32.	(A/G, 6%, 20)	:	7.6051
33.	(F/P, 7%, 15)	:	2.7590
34.	(P/F, 7%, 15)	:	0.3624
35.	(F/A, 7%, 15)	:	25.1290
36.	(P/A, 7%, 15)	:	9.1079
37.	(A/F, 7%, 15)	:	0.0398
38.	(A/P, 7%, 15)	:	0.1098
39.	(P/G, 7%, 15)	:	52.446
40.	(A/G, 7%, 15)	:	5.7583
41.	(F/P, 10%, 10)	:	2.5937
42.	(P/F, 10%, 10)	:	0.3855
43.	(F/A, 10%, 10)	:	15.9374
44.	(P/A, 10%, 10)	:	6.1446
45.	(A/F, 10%, 10)	:	0.0627
46.	(A/P, 10%, 10)	:	0.1627
47.	(P/G, 10%, 10)	:	22.891
48.	(A/G, 10%, 10)	:	3.7255

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