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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022**

COURSE NAME : ENGINEERING ECONOMY
COURSE CODE : BFC 44602 / BPK 30902
PROGRAMME CODE : BFF
EXAMINATION DATE : JANUARY / FEBRUARY 2022
DURATION : 2 HOURS
INSTRUCTION : 1. ANSWER **ALL** QUESTIONS.
2. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **CLOSE BOOK**.

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

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- Q1** (a) You are a resident engineer for a building construction project. One of your tasks is to participate in a joint-inspection for concreting activity. During the post-concrete inspection, you noticed that there was a water seepage in the first floor concrete slab, as shown in **Figure Q1**. Using general steps for the decision making process, propose the best solution to solve the problem. (10 marks)
- (b) MNM Century Sdn Bhd is a building contractor in Johor who just won the tender to construct 20 units of low-mid-cost house in Pontian, Johor. Both client and contractor agreed that the term for payment is based on the unit completed. For each unit completed, the contractor will be paid one-off payment worth RM 100,000. The contractor have to choose whether to use the traditional method or innovative IBS system in order to maximize their profit. The details for both construction methods are shown in **Table 1**.

Table 1

Description	Traditional Method	Innovative IBS System
Total construction duration	24 months	12 months
Working days/week	6 days	5 days
Cost Factors		
Fixed cost	RM 200,000	RM250,000
Site staff salary (total, monthly)	RM20,000	RM25,000
Labour cost (Average, daily)	RM80 x 5 pax	RM120 x 5 pax
M&E labour cost (per unit)	RM2,000	RM2,000
Material cost per unit	RM 30,000	RM 20,000

- (i) Demonstrate the best method between the two options from economic perspective? (8 marks)
- (ii) Based on your answer in **Q1(b)(i)**, calculate the minimum number of houses need to be sold before the company start gaining profit. (4 marks)
- (iii) Illustrate the breakeven graph for the selected method that include the breakeven point, total revenue, total cost and fixed cost. (3 marks)



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- Q2 (a)** Since the country was hit by the Covid-19 pandemic last year, almost all sectors have been affected including construction. Therefore, in 2021 the prices of construction materials have increased by 30% and continue to be expected high in demand of up to 40-50% for next years. **Table 2a** shows raw data of materials' over the three respective year. As a construction supplier, your company have to estimate the three types of construction materials. The weight placed on aggregate is three times compared with other materials in the market.

Table 2a

No	Type of materials on site	Price (RM/tonne) in year		
		2019	2020	2021
1	Bar reinforcement	235	290	380
2	Sand	89	102	110
3	Aggregate	67	88	80

- (i) Calculate a weighted index for the price of materials (per tonne) in 2021, when 2019 is the reference year having an index value of 92. (2 marks)
 - (ii) If Index in 2022 were estimated to be double from Index in 2021, analyze the price of each material at the year 2022, based on I_{2021} . (7 marks)
 - (iii) In your opinion, predict **TWO (2)** possible implications if the price of materials keep increasing. (4 marks)
- (b) A new factory needs a preliminary cost estimation using factor technique for capital expenditure for 3,000 square meters of lands, five units of warehouse, three cool rooms and a loading facility. Including to the risk assessment, the additional percent will be include in the unit's factors about 5-10% from each cost of capital expenditure.

Additional to that, estimating cost for working capital as to run the factory for 6-18 month are also needed as shown in **Table 2b**. Contingency expenses 10% from the total working capital estimated should also be included.



Table 2b

Details cost of capital expenditure	Cost (RM)
Lands	RM120/m ²
Warehouse	RM30,000/unit
Cool Room	RM15,000/unit
Loading Facility	RM9,000/unit
Details cost of working capital	
Raw Material	RM25,000/month
Labor Wages	RM8,000/month
Utilities Expenses	RM1,800/month
Administration Salary	RM3,000/month

- (i) Prepare an appropriate table to demonstrate all capital expenditure required for the project. (5 marks)

- (ii) Prepare an appropriate table to demonstrate all working capital required for the project. (7 marks)

Q3 Ramesh works at a construction company. He made a loan for a Chase Bank credit card that carried at a nominal rate of 14.24% per annum, or 1.187% per month. He loans a total of RM1000 and plans to start pay at the end of the first month. However Ramesh failed to do the payment as schedule for the first month. Therefore, the total due to be paid increased to RM1041.87.

- (a) If this situation continues for a total of 12 months, determine the total due after 12 months and the effective annual rate of interest Ramesh has accumulated. Remember, the fine print on the card’s interest and fee information states a penalty nominal rate of 30% per year after one late payment of the minimum payment amount, plus a late payment fee of RM39 per occurrence. For detail the interest and fees, show the figures in an appropriate table. (17 marks)

- (b) What amount should he ask to be transferred by the due date each month if there were no penalty nominal rate and no late payment fee. (3 marks)



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- (c) Justify if the effective annual interest rate would be charged for this year based on the answer in Q3 (a). (5 marks)

- Q4** (a) The state government of Pahang is planning to build a new concrete dam for hydroelectric facility in Jerantut district. Besides generating power, the dam which equipped with flood control system also be built for tourism attraction. The government already identified 2 potential, locations, A or B. The estimated benefits and costs for both locations under consideration are shown in **Table 3**. The interest rate for 20 years and 40 years life span are 5% and 7% respectively.

Table 3: Estimated costs and benefits

Cost and Benefit (RM million)	Location	
	A	B
Initial cost	180	210
Operational and maintenance costs per year	1.1	1.5
Power sales per year	2	1.0
Environmental impact per year	1.5	2.3
Recreation benefits per year	2.5	3.1
Irrigation benefits per year	3.2	4.1
Flood control per year	1.5	1.2

- (i) Determine the cost, benefit and disbenefit for 20 and 40 years of project life span using present worth (PW) method. (12 marks)
- (ii) Justify the most suitable location based on the benefit-cost analysis. (4 marks)
- (b) The Department of Works is proposing a new road construction and maintenance for Kampung Kota Dalam, Parit Raja, Batu Pahat, Johor. A new road will allow access to the new development area that previously could only be reached with off-road vehicles. The cost of rural road construction is expected to be RM600,000. The road will require annually maintenance work cost of RM30,000. The improved accessibility will led to a 200% increase in the property values along the road. Examine whether the project should be proceeded or not by determining the conventional B/C ratio with PW using an interest of 5% per year if the previous market value of a property was RM500,000. Consider $(10 + x)$ year of study period in your analysis, x is the last digit of your matric number. (9 marks)

– END OF QUESTIONS –



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FIGURE Q1

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LIST OF FORMULA

1. $p (1 + i)^n$
2. $C_n = C_k (I_n / I_k)$
3. $Z_u = K(i^n)$
4. $n = \log s / \log 2$
 $W1 (C_{n1}/C_{k2}) + W2 (C_{n2}/C_{k2}) + W... (C_{n...}/C_{k...})$
5. $I_n = \frac{W1 (C_{n1}/C_{k2}) + W2 (C_{n2}/C_{k2}) + W... (C_{n...}/C_{k...})}{W1 + W2 + W...} \times I_k$
6. Conventional B-C ratio with PW
 $B-C = PW(B) \div [(I - PW(MV)) + PW(O\&M)]$
7. Modified B-C ratio with PW
 $B-C = [PW(B) - PW(O\&M)] \div [I - PW(MV)]$
8. Conventional B-C ratio with AW
 $B-C = AW(B) \div [CR + AW(O\&M)]$
9. Modified B-C ratio with AW
 $B-C = [AW(B) - AW(O\&M)] \div CR$

