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**UTHM**  
Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2022/2023**

COURSE NAME : ENGINEERING ECONOMY  
COURSE CODE : BNJ 30902  
PROGRAMME CODE : BNM  
EXAMINATION DATE : JULY/ AUGUST 2023  
DURATION : 2 HOURS  
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 **SIX (6)** PAGES

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- Q1**
- (a) Show the simplified processes of top-down approach and bottom-up approach. (6 marks)
- (b) 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 a new genset with 150 MW to replace the old unit. Additional features of this genset for longer duration would cost RM20,000. Estimate the total cost of the 150 MW unit. (5 marks)
- (ii) As demand is forecast to be higher this year, another back-up genset of 50 MW is also considered to be purchased. Estimate the cost of a 50 MW unit of the same design including RM20,000 for the cost of additional features. (4 marks)
- (c) Given the assembly time for CKD MPV of *Venus8* is happened without any learning rate for 220 hours during the pilot batch of 10 units *Venus8*. Their improvement (learning rate) started during the first batch production is 0.9 and as the output doubled, their time to assemble a car is reduced by 10%.
- (i) Determine the time it will take the production line to assemble the 20<sup>th</sup> *Venus8*. (3 marks)
- (ii) Calculate the total time required to assemble the first 20 units of *Venus8*. (7 marks)
- Q2**
- (a) Define the term Economic Equivalence. (2 marks)
- (b) Engineering Department from Tessa Motor is to evaluate bids for new-generation coordinate-measuring machinery (CMM) worth RM500,000. **Table Q2(b)** is the three bids from the respective vendors with the interest rates that vendors will charge for the 10 years tenure.
- (i) Calculate the are the effective annual rates for all the three vendors. (9 marks)
- (ii) Choose the preferred vendor to proceed with the project. (2 marks)
- (iii) Find the Cost of Capital for the 10 years tenure of the preferred vendor. (4 marks)

- (c) MIQCyber now is leading cyber security company in Malaysia. To strengthen the company portfolio in long run MIQCyber has plan on signing up an investment package with a bank. The company net profit is going to be put into a fix deposit account for 15 years tenure with 7% compounded yearly. The term of signing up on the investment package is minimum RM22,000 require to be deposited yearly into the fix deposit account. The starting balance of the investment account is RM200,000 and MIQC saves the full amount of money available to the account.
- (i) Compute the minimum amount of money, MIQC will be generated at the end of term. (4 marks)
- (ii) Illustrate the complete cash flow timelines in accordance with the period of investment generated for each year. (4 marks)
- Q3** (a) **Table Q3(a)** is Indera Water economy parameter for a water treatment facility and the estimated costs. Classify whether Benefit, Disbenefit or Cost for each parameter in viewpoint of Indera Water. (7 marks)
- (b) Two metal punching machines are being evaluated for purchase by TF Manufacturing Sdn. Bhd. The Machine A has an initial cost of RM200,000 and salvage value at the end of six (6) years of Rm50,000. This machine would provide the firm with annual benefit of RM95,000. The Machine B would cost RM700,000 have a salvage value of RM150,000 at the end of twelve (12) years. The interest rate for the purchasing loan is 10% compounded by annual basis.
- (i) Calculate the B/C ratio for the Machine A and Machine B. (12 marks)
- (ii) Determine the best punching machine should be invested by the UZMA Autoparts, by using incremental B/C ratio analysis technique. (6 marks)
- Q4** (a) Heez Furniture is planning to proceed with a new production line for smart home furniture. List the **TWO** (2) types of capital financing for Heez Furniture to gain the project capital and give **TWO** (2) examples for each type of capital. (8 marks)
- (b) In an effort to develop sustainable and renewable energy in Malaysia, a new commercial vertical crop technology is being installed through a public-private partnership with Valencia Industries. The present worth of the total system cost is \$20 million with financing sources and costs as follows:
- |  |                               |
|--|-------------------------------|
| Commercial loan for debt financing             | RM10 million at 6.8% per year |
| Retained earnings from partnering corporations | RM4 million at 5.2% per year  |
| Sale of stock (common and preferred)           | RM6 million at 5.9% per year  |

There are three existing international vertical farming projects running at Valencia Industries with capitalization and WACC values as follows:

Project 1: RM5 millions with  $WACC_1$  7.9%

Project 2: RM30 millions with  $WACC_2$  10.2%

Project 3: RM7 millions with  $WACC_3$  4.8%

- (i) Calculate the fraction of D-E ratio for Valencia project. (6 marks)
- (ii) Calculate the D-E fraction of existing three projects by project size of total RM42 millions capital. (6 marks)
- (iii) Compare the WACC for Valencia Industries project with the WACC of the existing projects. (5 marks)

-END OF QUESTIONS -



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Table Q2(b)

Bid no.	Interest rate
Vendor 1	9% per year, compounded quarterly
Vendor 2	3% per quarter, compounded quarterly
Vendor 3	8.8% per year, compounded monthly

Table Q3(a)

Point	Economic parameter	Estimated Monetary
1	Cost of water: 10% annual increase to Allen households	Average of RM29.7 million
2	Bonds: Annual debt service at 3% per year on \$540 million	RM16.2 million
3	Use of land: Payment to Parks and Recreation for shaft sites and construction areas	RM300,000
4	Property values: Loss in value, sales price, and property taxes	RM4 million
5	Water sales: Increases in sales to surrounding communities	RM5 million (year 4) plus 5% per year (years 5–20)
6	M&O: Annual maintenance and operations costs	RM300,000 plus 4% per year increase
7	Peak load purchases: Savings in purchases of treated water from secondary sources	RM500,000

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## List of Formula

$$C_n = C_k \left( \frac{I_n}{I_k} \right)$$

$$C_a = C_b \left( \frac{S_a}{S_b} \right)^x$$

$$Z_u = K(u^n)$$

$$T_x = K \sum_{u=1}^x u^n$$

$$I = P X n X i$$

$$i_e = \left( 1 + \frac{i_n}{i_m} \right)^m - 1$$

$$ROR (\%) = \frac{V_c - V_o}{V_o} X 100$$

$$F = P(1 + i)^n$$

$$F = A \left[ \frac{(1+i)^n - 1}{i} \right] = A (F/A, i\%, n)$$

$$P = A \left[ \frac{(1+i)^n - 1}{i(1+i)^n} \right] = A (P/A, i\%, n)$$

$$A = F \left[ \frac{i}{(1+i)^n - 1} \right] = F (A/F, i\%, n)$$

$$B/C = \left( \frac{\text{benefit} - \text{disbenefit}}{\text{cost}} \right) \text{ or } \left( \frac{\text{benefit} - \text{disbenefit} - \text{M\&O cost}}{\text{initial investment}} \right)$$

$$\Delta B/C = \Delta B / \Delta C$$

$$WACC = (\text{equity fraction})(\text{cost of equity capital}) + (\text{debt fraction})(\text{cost of debt capital})$$