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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

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

COURSE NAME : BUILDING MAINTENANCE  
COURSE CODE : BFB 40903  
PROGRAMME CODE : BFF  
EXAMINATION DATE : JANUARY / FEBRUARY 2021  
DURATION : 3 HOURS  
INSTRUCTION : 1. ANSWER ALL QUESTIONS.

2. THIS FINAL EXAMINATION IS  
AN **ONLINE** ASSESSMENT AND  
CONDUCTED VIA **CLOSE**  
**BOOK**.

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THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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- Q1** (a) Building maintenance constitutes essential practices to sustain the performance of buildings within required standards. Thus, building maintenance practices have a remarkable effect on the longevity of a building. A comprehensive building maintenance decision making will ensure the efficiency of building systems, components, and effectiveness of maintenance equipment. Provide a diagram of a decision-based flow approach to determine the suitable types of maintenance technique for an old museum building maintenance works. (5 marks)
- (b) As a senior maintenance engineer in the maintenance department, you are required to give your opinion to the top management and project teams concerning the maintenance planning strategy for the entire life cycle of a new high-performance laboratory building project. Determine **FIVE (5)** issues each in design and operational stage that to be highlighted to the top management and project teams for the building maintenance requirement as following;
- (i) Design stage (10 marks)
- (ii) Operational stage (10 marks)
- Q2** (a) A new office building will be constructed at UTHM, Parit Raja Campus, with a limited budget from the university. The architect team has put forward two design proposals for the window and you are the leader of the building maintenance unit been assigned to provide a life cycle cost analysis (LCCA) and advice the architect team on the most satisfactory solution to be constructed. Based on the information given in **Table Q2a**, recommend the most economical design based on the LCCA to be selected. (10 marks)
- (b) A new equipment will be installed in a high-performance laboratory building at UTHM, Pagoh Campus. As a senior building maintenance in the building maintenance unit, you have been assigned by the management to exercise a life cycle costing analysis (LCCA) for estimating the total life cycle cost of equipment procurement. Based on the data provided in **Table Q2b**, justify which type of equipment is economical to be used. The interest rate is assumed to be 7.55% and the expected lifespan of equipment is 25 years. (15 marks)

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- Q3** Building Condition Assessment (BCA) is an assessment aimed to investigate the root causes of identified building defects and subsequently provide rectification solutions to ensure the building can continue in service without causing safety hazards to its occupiers. The assessment is carried up through visual assessment, identify major defects and form an opinion regarding the condition of the facilities at the time of inspection.
- (a) Explain the protocol matrix used for visual inspection and assessment of building conditions using the Guideline of Inspection and Condition Assessment, JKR 21602. (7 marks)
- (b) Evaluate **THREE (3)** structural defects that are commonly identified during building condition assessment (BCA) for the 3-storeys school building occupied more than 50 years, complete with rating score and action matrix using Inspection and Condition Assessment Protocol, JKR 21602. (15 marks)
- (c) Propose **ONE (1)** appropriate repair work for any critical defects identified in **Q3(b)**. (3 marks)
- Q4** (a) Supervision of building maintenance works is important to ensure that the maintenance works have been done by following the requirement of standards and procedures from start to finish period. Identify the key process of supervising maintenance works executed by the contractor for the upgrading and maintenance of laboratory buildings. (10 marks)
- (b) Maintenance planning is the process of establishing sequences and relationships of actions and priorities before the commencement of work, along with the provision of the resources needed to deliver the work plan. As a senior maintenance engineer in the maintenance department, you need to provide maintenance planning for monitoring and controlling the maintenance operation for the Tunku Tun Aminah Library building. Create preventive maintenance planning for the following services;
- (i) Cooling tower  
(ii) Lighting System  
(iii) Portable Extinguishers (15 marks)

– END OF QUESTIONS –

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**TABLE Q2a**

Description	Window A (RM)	Window B (RM)
Initial cost	20,000	
Treatment every 10 years	800	
Annual cleaning and minor repairs	850	
Replacement of window at year 40	25,000	
Initial cost		25,000
Repainting every 5 years from year 15		1,000
Annual cleaning and minor repairs		2,000
Replacement of window at year 40		28,000

**TABLE Q2b**

Description	Equipment A (RM)	Equipment B (RM)	Equipment C (RM)	Equipment D (RM)
Procurement cost	450,000	370,000	390,000	550,000
Expected lifespan	25 years			
Annual failure rate	0.06	0.09	0.08	0.05
Cost of a failure	45,000	25,500	35,000	50,000
Interest rate	7.55%			
Annual operating cost	8,500	5,500	7,500	10,000