

**UNIVERSITY COLLEGE TATI (UC TATI)****FINAL EXAMINATION QUESTION BOOKLET**

COURSE CODE	: BME 3053
COURSE	: MAINTENANCE PLANNING & CONTROL
SEMESTER/SESSION	: 2-2023/2024
DURATION	: 3 HOURS

Instructions:

1. This booklet contains 4 questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO
THIS BOOKLET CONTAINS 5 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

- a) **Discuss** how maintenance can increase the profitability of company. (3 Marks)
- b) **Show** how maintenance management principles are relevant in the service industry. (4 Marks)
- c) Discuss the concept of replacement problems in maintenance. What factors are considered when deciding whether to replace an item or continue repairing it? **Illustrate** your answer by providing real case scenario. (6 Marks)
- d) Imagine you are a maintenance manager in a manufacturing plant. You need to determine the crew size for a specific maintenance task. **Identify** on how you would use the analytical queuing model to determine the optimal crew size. Consider factors such as arrival rate, service rate, and queue length in your explanation. (6 Marks)

QUESTION 2

- a) Describe the concept of reactive or corrective maintenance. What are the characteristics of this type of maintenance activity? Provide examples to illustrate your answer and **find** the potential drawbacks of relying solely on reactive maintenance. (7 Marks)
- b) **Explain** the concept of predictive maintenance (PDM) and its role in modern maintenance practices and discuss the key principles and techniques used in predictive maintenance. Justify your answer with proper examples of how predictive maintenance can help optimize maintenance schedules, minimize downtime, and reduce costs in various industries. (10 Marks)
- c) Read the case study carefully. The next question is based on the case study attached.

E&O Hotel is a popular luxury hotel that prides itself on providing exceptional guest experiences. To ensure the smooth operation of their facilities and minimize any disruptions to their guests' stay, they have implemented a comprehensive preventive maintenance program.

The hotel's preventive maintenance program includes regular inspections, scheduled maintenance activities, and equipment servicing. The maintenance team conducts routine checks on various systems, such as HVAC, electrical, plumbing, and fire safety systems. They also perform preventive maintenance tasks like lubrication, filter replacements, and calibration of equipment.

One day, during a routine inspection of the hotel's HVAC system, the maintenance team identified a potential issue with a chiller unit. They noticed an unusual noise coming from the unit and observed that the temperature readings were fluctuating more than usual. Recognizing the significance of the issue, they immediately scheduled a maintenance technician to investigate further.

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Upon inspection, the technician discovered a faulty fan motor in the chiller unit. The motor was running at a reduced speed, causing inefficient cooling and potentially leading to a complete breakdown. The technician promptly replaced the faulty motor and performed a comprehensive check of the chiller system. This preventive maintenance action prevented a major breakdown and ensured uninterrupted cooling for the hotel's guests.

In your opinion, **illustrate how** did the hotel's implementation of preventive maintenance contribute to their ability to provide exceptional guest experiences.

(10 Marks)

QUESTION 3

- a) **Identify** the reliability improvement concept and its significance in maintenance management. Discuss various strategies and techniques that can be implemented to enhance reliability in a system or equipment. Provide examples to support your answer.

(10 Marks)

- b) **Calculate** the reliability calculation for the engineering system in Figure 1.

(7 Marks)

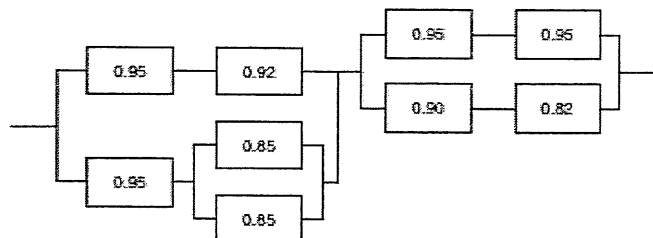


Figure 1: Engineering System

- c) **Construct** a sample form for conducting FMECA analysis on process types.

(10 Marks)

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QUESTION 4

a) **Give examples** on the characteristics of maintenance projects. (4 Marks)

b) Following is the CPM project activity table as in Table 1.

Table 1: Activity Table for CPM project

Activity	Immediate predecessor	Times (days)	\$ Cost (dollars)
A	-	10	2000
B	-	8	500
C	A	13	800
D	A	11	750
E	B	12	1500
F	B	15	650
G	C	15	1600
H	C	7	400
I	D, E	8	600
J	F, H, I	13	800

i. **Construct** the related network diagram. (5 Marks)

ii. **Calculate** a network analysis project time including (the earliest start time, latest start time, earliest finish time, latest finish time), critical path, and cost. (14 Marks)

c) **Elucidate** the distinction between PERT and CPM as network tools. (4 Marks)

-----End of question-----

