UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	RELIABILITY AND TESTABILITY IC DEVICE
COURSE CODE	:	BEJ 43803
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JULY/ AUGUST 2023
DURATION	:	3 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 **FOUR (4)** PAGES

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Q1 (a) Explain in details different between fault and failure.

(10 marks)

(b) Draw a diagram of a system containing three components in parallel and connected with other two components in series.

(5 marks)

(c) Calculate the reliability for the system in **Q1 (b)** of each component is 0.9.

(10 marks)

Q2 (a) Define term and the purpose of failure analysis.

(8 marks)

(b) Extrapolate a report for Non Destructive Test (NDT) with complaining no current flow between input pin and output pin. Therefore, you need to provide 8D report to customer to answer the report.

(17 marks)

Q3 (a) Explain the difference between fault tree and event tree.

(5 marks)

(b) Calculate the Probability of Fire happening using **Figure Q3(b)** using below data:

    i. Oxygene presense probability – 1
    ii. Paper presence probability – 0.1
    iii. Plastic presence probability – 0.09
    iv. Petrol presence probability – 0.02
    v. Discarded cigarette presence probability – 0.2
    vi. Electrical fault presence probability – 0.05
    vii. Deliberate act porability – 0.1

(10 marks)

(c) Explain in details **FOUR (4)** stages in Failure Mode Effect Analysis (FMEA).

(10 marks)

Q4 Design the system and develop the mathematical expression for the reliability of the following three system configurations assuming that each component in the system is identical and can exist in either an operational state or a failed state. The reliability of each component is given by the following expression:

$$R(t) = e^{-\lambda t}$$

For each system configuration calculate the system reliability given the following individual component parameters:

$$\lambda = 0.00439 \text{ failures/h}, t = 24 \, h$$

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(i) Design System configuration 1: simple parallel redundant system.

System success criterion: one or more components operating required for system success.

(5 marks)

(ii) Design System configuration 2: bimodal parallel-to-series redundant system. Parallel subsystem success criterion: one or more components operating required for subsystem success. System success criterion: both subsystems operating successfully.

(10 marks)

(ii) Design System configuration 3: bimodal series-to-parallel redundant system .Series subsystem success criterion: both components operating for subsystem success. System success criterion: one or more subsystems operating successfully.

(10 marks)

- END OF QUESTIONS –

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Figure Q3(b)

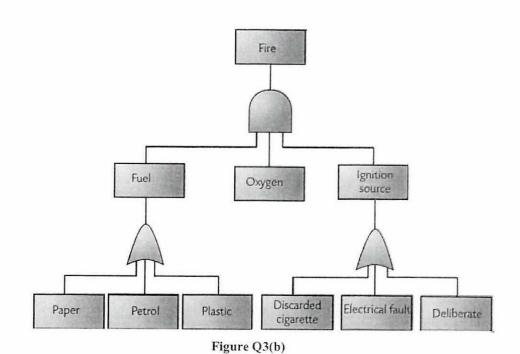TERBUKA

4