UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: BPE 3223
COURSE	: DESIGN AND FAILURE ANALYSIS
SEMESTER/SESSION	: 2-2024/2025
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 3 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1 (34 MARKS)

Different analyses can determine product failure.

a) Compare between ductile failure and brittle failure. (8 marks)

b) Ultraviolet (UV) radiation causes environmental failure.

i. Find what UV radiation is. (2 marks)

ii. Identify two (2) benefits and two (2) harmful effects of UV radiation. (8 marks)

c) Acid rain is one of the factors that contribute to the product failure. Analyze the acid rain phenomenon. In addition, debate three (3) reasons why acid rain is hazardous for the ecosystem. (10 marks)

d) Moisture-related problems in flooring and coating lower the properties of the product. Diagnose the statement. (6 marks)

QUESTION 2 (26 MARKS)

Pollution is the introduction of contaminants into the natural environment that cause adverse changes.

a) Determine three (3) types of water pollution and their sources. (9 marks)

b) The agriculture industry tends to contribute to land pollution.

i. Find three (3) sources of contamination from this industry. (3 marks)

ii. Identify two (2) effects of the pollution and two (2) ways to prevent it. (4 marks)

c) Fourier Transform Infrared (FT-IR) analysis is capable of detecting soil contamination. Illustrate the FT-IR graph to compare between the contaminated and non-contaminated soils. Examine the graph based on the peaks that appeared. (10 marks)

QUESTION 3 (20 MARKS)

Several laboratory techniques are implemented to analyze the product failures.

a) Find the purpose of these analyses:

i. Design of Experiments (DOE). (4 marks)

ii. Accelerated system analysis. (2 marks)

b) There are two (2) types of the Analysis Modeling approaches. Compare between two of them. (8 marks)

c) Identify three (3) goals of Analysis Modeling. (6 marks)

QUESTION 4 (20 MARKS)

Finite Element Analysis (FEA) is the basis of modern software simulation software, with the results usually shown on a computer-generated color scale.

a) Debate the benefits of FEA. (4 marks)

b) Find two (2) suitable software for FEA and two (2) advantages for each. (6 marks)

c) Product failure may increase the production cost.

i. Identify three (3) reasons for new-product failure. (3 marks)

ii. Predictive Failure Analysis (PFA) refers to methods intended to predict imminent failure of systems or components. Analyze how the PFA works. (7 marks)

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