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**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

**FOURTH YEAR FIRST SEMESTER
MAIN EXAMINATIONS**

**FOR THE DEGREE OF BACHELOR OF SCIENCE IN RENEWBLE
ENERGY AND BIOFUELS TECHNOLOGY**

COURSE CODE: REN 414

COURSE TITLE: QUALITY RELIABILITY ENGINEERING

DURATION: 2 HOURS

DATE: 21/04/202

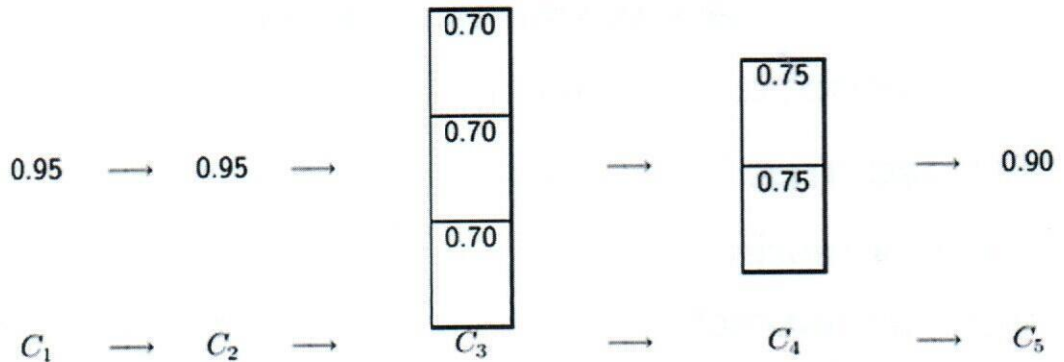
TIME: 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

QUESTION 1 (30 marks)

- a. Define the following terms:
- i. Quality (1 mark)
 - ii. Reliability (1 mark)
 - iii. Process capability (1 mark)
 - iv. Specification (1 mark)
 - v. Quality assurance (1 mark)
- b. State any five (5) points in quality Deming philosophy and management. (5 marks)
- c. State any five (5) reasons why the control charts are popular. (5 marks)
- d. State the process of reliability management. (5 marks)
- e. 10 components of a solar system were tested. The component 1, 2, 3, 4, 5 failed after 70, 110, 125, 310, 520 hours. Find the failure rate and mean time till failure. (5 marks)
- f. Find the reliability of the series-parallel system below. (5 marks)



QUESTION 2 (20 marks)

- a. Explain any six (6) dimensions of Quality. (6 marks)
- b. Differentiate between manufacturing quality and service quality giving four examples of each. (6 marks)
- c. Explain the four (4) components involved in quality system documentation. (4 marks)
- d. Explain the four (4) stages of quality control involvement. (4 marks)

QUESTION 3 (20 marks)

- a. State any four (4) reasons for sampling. (4 marks)
- b. Explain any three (3) random sampling techniques. (3 marks)
- c. State any five (5) situations where lot-to-lot acceptance sampling is used. (5 marks)
- d. Explain any three (3) sampling plans. (3 marks)
- e. The percent defective of the incoming lots is 3%. An OC curve showed the probability of acceptance to be 0.515. Given a lot size of 2,500 and a sample of 120, what is the average outgoing quality in percent defective? (5 marks)

QUESTION 4 (20 marks)

- a. Explain any five (5) reasons that make reliability to be important. (5 marks)
- b. Explain any five (5) reasons for reliability engineering. (5 marks)
- c. State any four (4) assumptions in process capability analysis. (4 marks)
- d. State the steps involved in the process capability analysis. (6 marks)

QUESTION 5 (20 marks)

- a. Explain the Bathtub curve in terms of Phase, Failure Rate, Possible causes and possible improvement actions including a sketch. (10 marks)
- b. State any four (4) objectives of maintainability. (4 marks)
- c. State any three (3) forms of the steady state availability including their formulas. (6 marks)