KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

FOURTH YEAR FIRST SEMESTER
SPECIAL/SUPPLEMENTARY 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: 14/11/2022 **TIME: 2:00PM-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.

This paper consists of **3** printed pages. Please Turn Over

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)

a. State any five (5) reasons why the control charts are popular. (5 marks)
b. State any five (5) points in quality Deming philosophy and management. (5 marks)
c. Explain any five (5) reasons for reliability engineering. (5 marks)
d. State any five (5) major tools found in Statistical Process Control. (5 marks)
e. State any five (5) situations when lot-to-lot acceptance sampling is to be used. (5 marks)
f. 10 components of a solar system were tested. The component 1, 2, 3, 4, 5 failed after 80, 120, 135, 320, 520 hours. Find the failure rate and mean time till failure. (5 marks)

QUESTION 2 (20 marks)

a. Describe the process of reliability management. (5 marks)
b. State any five (5) process capability indices stating the index and its estimation equation. (10 marks)
c. 200 cars have accumulated 18000 hours, 30 failures are observed.
   i. What is the MTBF? (3 marks)
   ii. What is the failure rate? (2 marks)

QUESTION 3 (20 marks)

a. State any four (4) assumptions in process capability analysis. (4 marks)
b. State the steps involved in the process capability analysis. (6 marks)
c. State any four (4) conditions for maintainability requirements. (4 marks)
d. State any three (3) forms of the steady state availability giving their mathematical expressions. (6 marks)

QUESTION 4 (20 marks)

a. Explain any four (4) dimensions of quality. (4 marks)
b. Differentiate between manufacturing quality and service quality giving examples. (4 marks)
c. Explain any three (3) lot-by-lot acceptance sampling plans for attributes. (6 marks)
d. 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 3,000 and a sample of 120, what is the average outgoing quality in percent defective? (6 marks)

QUESTION 5 (20 marks)

a. Explain any four (4) reasons why reliability is an important product attribute. (4 marks)

b. Explain any three (3) random sampling techniques. (6 marks)

c. State the four (4) components involved in quality system documentation. (4 marks)

d. Comment on the process in Fig. 1 and Fig. 2 in terms of statistical control and capability. (6 marks)

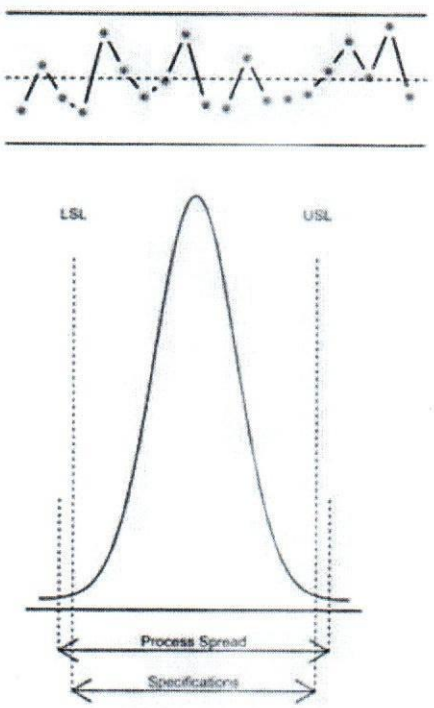

Fig. 1

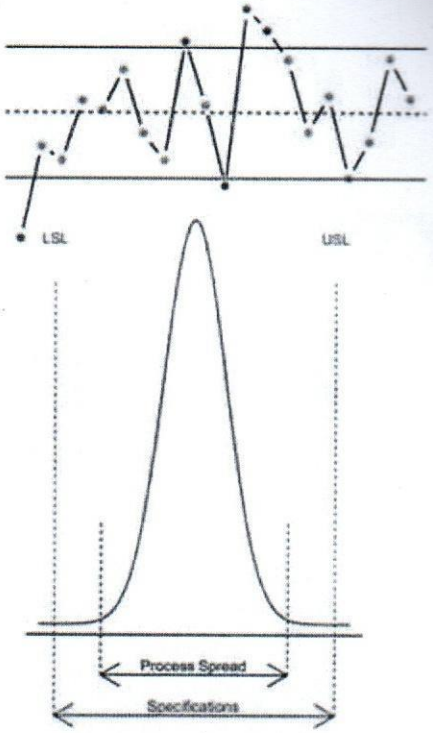

Fig. 2