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KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR**

**FOURTH YEAR FIRST SEMESTER
MAIN EXAMINATIONS**

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

COURSE CODE: IPT 422

COURSE TITLE: QUALITY RELIABILITY ENGINEERING

DURATION: 2 HOURS

DATE: 13/07/2021

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.

This paper consists of 3 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

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) reasons why the control charts are popular. (5 marks)
- c. State any five (5) points in quality philosophy and management. (5 marks)
- d. Explain any five (5) reasons for reliability engineering. (5 marks)
- e. State any five (5) major tools found in Statistical Process Control. (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. State any four (4) objectives of maintainability. (4 marks)
- b. State any three (3) forms of the steady state availability giving their mathematical expressions. (6 marks)
- c. Explain the Bathtub curve in terms of Phase, Failure Rate, Possible causes and possible improvement actions including a sketch. (10 marks)

QUESTION 3 (20 marks)

- a. State the four (4) components involved in quality system documentation. (4 marks)
- b. Explain any three (3) lot-to-lot sampling plans. (6 marks)
- c. State any five (5) process capability indices stating the index and its estimation equation. (10 marks)

QUESTION 4 (20 marks)

- a. State any five (5) major tools of Statistical process control. (5 marks)
- b. State any five (5) situations when lot-to-lot acceptance sampling is to be used. (5 marks)
- c. Explain any five (5) reasons why reliability is an important product attribute. (10 marks)

QUESTION 5 (20 marks)

- a. 200 cars have accumulated 15000 hours, 10 failures are observed.
 - i. What is the MTBF? (3 marks)
 - ii. What is the failure rate? (2 marks)
- b. Six oil pumps were tested with failure hours of 45, 35, 62, 94, 79 and 103.
 - i. What is the MTTF? (3 marks)
 - ii. Failure rate? (2 marks)
- c. The percent defective of the incoming lots is 2%. An OC curve showed the probability of acceptance to be 0.68. Given a lot size of 1,000 and a sample of 85,

what is the average outgoing quality in percent defective?
(4 marks)

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

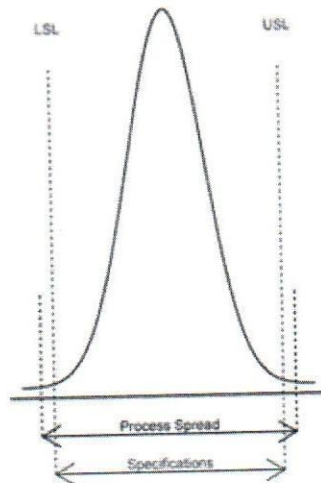
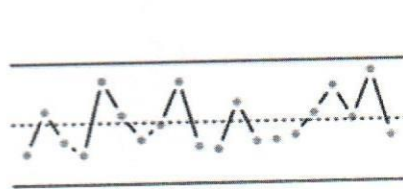


Fig. 1

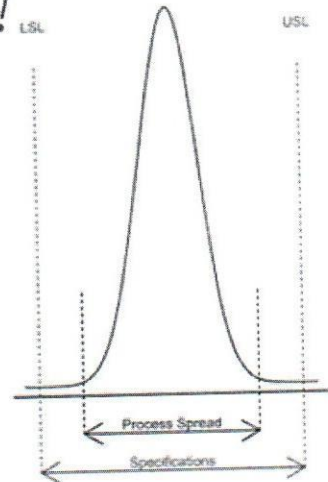
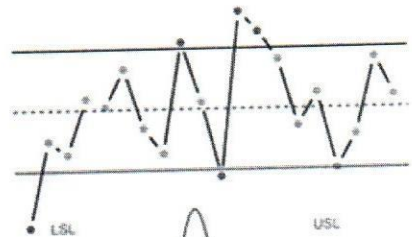


Fig. 2