

2112E132

**BACHELOR OF VOCATION**  
**Mechanical Manufacturing**  
**Subject: Quality Control and Reliability Engineering**  
**Subject Code: IMS-601**  
**Semester: Third**  
**December 2021**  
**Theory (External): 70 Marks**  
**Time: 03 Hours**

**Instructions to the Students**

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of objective type in nature. All questions are compulsory. Each question carries 2 mark.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 10 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything on the question paper.
6. Wherever necessary, the diagram drawn should be neat and properly labelled

Roll Number									

**SECTION -A (SHORT/OBJECTIVE TYPE QUESTIONS)**  
(10 x 2 = 20 Marks)

- A Quality may be expressed as
- a) Degree of satisfaction
  - b) Conformance to the specification
  - c) Degree of perfection
  - d) All of these
- B ISO 9000 is concerned with
- a) Quality management systems
  - b) Environmental management systems
  - c) Inventory management systems
  - d) None of these
- C X-bar and R-chart are used for
- a) Variables
  - b) Attributes
  - c) Both variable and attributes
  - d) None of these
- D Which of the following is used as a control chart for defectives?
- a) X-bar and R-chart
  - b) p-chart
  - c) c-chart
  - d) u-chart
- E Upper limit on the percentage of defects a customer is willing to accept (a property of the consumer) is known as \_\_\_\_\_.
- a) Acceptable Quality Level (AQL)
  - b) Average Total Inspection (ATI)

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reliability of 0.8 each and those in series have a reliability of 0.6 each. Determine the reliability of the entire system.

- Q8 a) What do you understand by reliability? Why is it important to analyze the reliability of the manufacturing system?  
b) Discuss the various techniques for improving the reliability of a system?

==END OF PAPER==

c) Average Outgoing Quality Limit (AOQL)      d) Lot Tolerance Percent Defective (LTPD)

F If the Average outgoing Quality is plotted against the Incoming Fraction Defective, the Average Outgoing Quality Limit is the \_\_\_\_\_ point.

- a) Highest      b) Lowest  
c) Middle      d) Cannot be determined

G Mean time between failure is used for

- a) irreparable items      b) repairable items  
c) Both irreparable items and repairable items      d) None of these

H In a system, of 10 components, each of reliability factor 0.90 are in series. What is the overall reliability of the system?

- a) 0.95      b) 0.75  
c) 0.55      d) 0.35

I Which of the following is represented by Bathtub curve?

- a) Failure rate      b) Reliability  
c) Availability      d) None of these

J Reliability can be improved in the following way(s):

- a) Component design      b) Production techniques  
c) Redundancy      d) All of these

**SECTION -B (ESSAY TYPE QUESTIONS)**

(5 x 10 = 50 Marks)

- Q1 Explain the term 'quality cost'. Discuss the various components of cost of quality.
- Q2 a) Discuss the main elements of TQM.  
b) Define quality circle. State the characteristics of quality circles.
- Q3 In a capability study of a lathe used in turning a shaft to a diameter of  $23.75 \pm 0.1$  mm a sample of 6 consecutive pieces was taken each day for 8 days. The diameter of these shafts are as given below:

1 <sup>st</sup> day	2 <sup>nd</sup> day	3 <sup>rd</sup> day	4 <sup>th</sup> day	5 <sup>th</sup> day	6 <sup>th</sup> day	7 <sup>th</sup> day	8 <sup>th</sup> day
23.77	23.80	23.77	23.79	23.75	23.78	23.76	23.76
23.80	23.78	23.78	23.76	23.78	23.76	23.78	23.79
23.78	23.76	23.77	23.79	23.78	23.73	23.75	23.77
23.73	23.70	23.77	23.74	23.77	23.76	23.76	23.72
23.76	23.81	23.80	23.82	23.76	23.74	23.81	23.78
23.75	23.77	23.74	23.76	23.79	23.78	23.80	23.78

Construct the  $\bar{X}$  and R chart and find out the process capability for the machine.

- Q4 a) Distinguish between p chart and c chart. Also discuss some situations in which c chart is most applicable.  
b) A manufacturer purchases small bolts in cartons that usually contain several thousand bolts. Each shipment consists of a number of cartons. As a part of the acceptance procedure for these bolts, 400 bolts are selected at random from each carton and are subjected to visual inspection for certain defects. In a shipment of 10 cartons the respective percentages of defectives in the samples from each carton are 0, 0, 0.5, 0.75, 0, 2.0, 0.25, 0, 0.25 and 1.25. Does this shipment of bolts appear to exhibit statistical control with respect to the quality characteristics examined in the inspection?
- Q5 a) What is an OC curve? Explain its purpose.  
b) Construct OC curve for the following single sampling plan:  $n = 300, c = 5$
- Q6 a) Differentiate between producers' risk and consumer's risk.  
b) How do you differentiate between single sampling plan and double sampling plan? Explain with the flow charts.
- Q7 a) Explain the term 'life-testing'. Describe the objectives of life-tests.  
b) In a system, there are five components in parallel followed by four components in series. The components in parallel have a