

Indian Statistical Institute, Bangalore
Statistical Quality Control & Operations Research Unit
MS (QMBA) First Year [Batch 2026-2027]
Subject: **Quality Management-I**

Exam: **Midterm**
Maximum Marks: **30**

Date: **10th September 2026**
Duration: **2.0 hours**

Figure in the right-hand margin indicates full marks for the questions.

1 Answer the following (Any three)

- a) Define quality and explain the major elements of quality with a suitable example. [5]
- b) Explain the major principles involved in implementing Total Quality Management (TQM) in an organization, with a suitable example. [5]
- c) Explain the concept of ROI & Net Present Value (NPV) and its importance in evaluating quality investments. [5]
- d) Differentiate between quality of design, quality of conformance and quality of performance with suitable example. [5]

2 a) ABC Auto Components Ltd. manufactures brake assemblies and earned annual revenue of ₹60,00,000. During the year, it incurred ₹1,20,000 on employee quality training, ₹2,40,000 on final inspection and testing, ₹3,60,000 on scrap and rework detected before dispatch, and ₹4,80,000 on warranty claims and customer returns; however, the supplier reimbursed 25% of the warranty cost, and this reimbursement is not included in the company's revenue. Management is considering an automated inspection system with a quoted price of ₹5,50,000, excluding an installation cost of ₹50,000. The system is expected to reduce inspection costs by 25%, scrap and rework costs by 40%, and gross warranty costs by 50%; the supplier will continue reimbursing 25% of the remaining warranty cost, while training costs will remain unchanged. The system requires annual maintenance of ₹30,000, has a useful life of three years, and an estimated salvage value of ₹60,000 at the end of the third year. Using a 10% annual discount rate, classify the quality costs and calculate the total Cost of Quality, percentage of COQ revenue, net annual cash savings, ROI, simple payback period, NPV and discounted payback period. Based on your calculations, recommend whether the investment should be accepted. [5]

- b) An e-commerce fulfilment centre processes 20,000 orders per week, with an average of five defect opportunities per order. During a particular week, the Quality Assurance team identified 72 picking defects, 48 packaging defects and 40 labelling defects. Of the total defects identified, 75% are successfully corrected internally at a rework cost of ₹300 per defect. The remaining defects reach customers and result in an external failure cost of ₹1,200 per defect. Management is considering installing an automated verification system costing ₹30,000 per week, which is expected to reduce the original number of defects by 60%. Calculate the total defects, DPU, DPO, DPMO, opportunity yield, approximate Sigma Level, number of successfully reworked defects, number of defects reaching customers and total Cost of Poor Quality (COPQ). After implementing the system, calculate the revised number of defects, revised DPMO, revised COPQ, gross cost savings and net weekly savings, and recommend whether the system should be installed. [5]**

3 Write short notes with a suitable example (Any two)

[2.5 x 2 = 5]

- a) Kano Model of Quality.
- b) Strategic Quality Management.
- c) Product Life Cycle.

*******Best of Luck*******