



Answer the following questions:

Question 1 (20 marks)

- According to the quality expert Feigenbaum, interpret the meaning of quality as well as the meaning of control in the phrase "quality control", and define total quality control. (6 marks)
- Explain the different jobs of quality control. (8 marks)
- Identify with brief explanation only six of the major factors affecting product quality. (6 marks)

Question 2 (20 marks)

- Distinguish between dimensions of quality in products and services. (6 marks)
- Consider the application of quality function deployment methodology to design an electric iron, it is required to construct parts of the house of quality for the electric iron as follows (14 marks):
 - Identify at least 5 customer requirements ("Whats").
 - Identify at least 5 engineering characteristics ("Hows").
 - Assign a degree of importance to each customer requirement (use ranking 1-5).
 - Fill in the body of the house (relationship matrix) using the following symbols: (●) for "strong", (○) for "moderate", and (Δ) for "weak".
 - Fill in the roof of the house (the correlation matrix) using (+) for positive correlation and (-) for negative correlation.

Question 3 (20 marks)

- Discuss the different characteristics of a total quality system. (7 marks)
- Classify the following quality related costs as prevention costs, appraisal costs, internal failure costs, or external failure costs. (6 marks)
 - Cost of scrap
 - Product-design verification costs
 - Warranty claims costs
 - quality training costs
 - Inspection costs
 - Product liability costs

- c) Assume that during a FEMA analysis, the failure modes A, B, and C have been assigned the values given in the following table. (7 marks)

| Failure mode | Severity | Occurrence | Detection |
|--------------|----------|------------|-----------|
| A | 4 | 5 | 10 |
| B | 4 | 8 | 2 |
| C | 9 | 2 | 1 |

Calculate the RPN for each failure mode, Examine the obtained values and decide whether the RPNs can be used alone to prioritize the failure modes or specify other measures that should be also considered.

Question 4 (20 marks)

- a) Define quality engineering technology and illustrate the major groups of techniques used in quality engineering technology. (8 marks)
- b) There are many techniques employed by process control engineering technology, identify the major groups of these techniques. Select only one of these groups and provide two examples of the techniques in this group and explain the purpose of each technique. (6 marks)
- c) Consider the three poka-yoke methods: contact methods, fixed-value methods, and motion-step methods. Explain each method and illustrate your answer with examples. (6 marks)

Question 5 (20 marks)

- a) List the basic functions of quality information equipment, and demonstrate the criteria affecting the degree of automation of such equipment. (7 marks)
- b) You have studied the seven basic quality tools as well as the seven new quality tools, decide which of these tools is the most appropriate in the following situations: (8 marks)
- You want to identify the vital few causes of a problem.
 - You want to collect and classify data.
 - You want to organize verbal ideas generated during a brain storming session.
 - You want to identify what might go wrong in a plan and be ready with countermeasures.
- c) The DMAIC approach is considered as a continuous improvement methodology for Six Sigma. Explain the different steps of this approach. (5 marks)

===== End of Questions =====

With our best wishes

| This exam measures the following ILOs | | | | | | | | | | | | | | |
|---------------------------------------|----------------------------------|----------------------------|------|------|------------------------|---------------------|---------------|------|------|---------------|---------------------|--------------|------|--------------|
| Question Number | Q1-a. | Q5-b,c. Q4-a,b. Q5-a | Q2-a | Q1-c | Q1-a, Q3-a, Q1-b | Q5-b, Q4-b | Q3-c, Q5-c | Q2-b | Q3-b | Q5-c, Q4-b | Q3-b | Q4-c Q5-c | Q4-a | Q2-b Q4-c |
| Skills | a1-1 | a1-2 | a2-1 | a2-2 | a5-1 | b2-1 | b2-2 | b4-1 | b6-1 | b6-2 | c3-1 | c3-2 | c4-1 | c4-2 |
| | Knowledge & Understanding Skills | | | | | Intellectual Skills | | | | | Professional Skills | | | |