

QUALITY CONTROL AND MANAGEMENT
(MECH 4129)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group - A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Which Quality Guru's work is based on "theory of variance"?
(a) Juran (b) Crosby (c) Deming (d) Taguchi.
- (ii) Which Japanese word means "neatness" in English?
(a) Seiri (b) Seiso (c) Seiton (d) Seiketsu.
- (iii) Which of the following means producing a product to meet the specifications?
(a) Quality of design (b) Quality of performance
(c) Quality of conformance (d) Quality of customer service.
- (iv) The costs associated with defective products produced come under
(a) cost of prevention (b) cost of internal failure
(c) cost of external failure (d) cost of appraisal.
- (v) \bar{X} chart indicates
(a) consistency of the process (b) variability
(c) centering of the process (d) proportion of defectives.
- (vi) The control chart for number defects per sample is
(a) p-chart (b) np-chart
(c) C-chart (d) \bar{X} chart.
- (vii) Quality is defined by the customer is
(a) an unrealistic definition of quality
(b) a user-based definition of quality
(c) a manufacturing-based definition of quality
(d) a product-based definition of quality.
- (viii) PDCA cycle is the contribution of
(a) Walter Shewhart (b) Philip Crosby
(c) Ginichi Taguchi (d) W. Edward Deming.

- (ix) TQM culture of quality requirements focuses on
 (a) Product oriented (b) Process oriented
 (c) Customer oriented (d) Supplier oriented.
- (x) With six sigma, the common measurement index is
 (a) capability of the process control (b) defect per unit
 (c) 3-4 ppm defects (d) improved reliability.

Fill in the blanks with the correct word

- (xi) The house of Quality is a tool of _____.
- (xii) _____ is also known as fish bone diagram.
- (xiii) _____ is a series of standards dealing with quality management systems.
- (xiv) Reliability is the degree to which a unit of equipment performs its intended function under ____ for ____ of time.
- (xv) Total Quality Assurance = Quality of design + Quality of conformance + _____.

Group - B

2. (a) List out five factors and briefly discuss each of these factors which influence customer's buying decision. [[CO1](Analyse/IOCQ)]
- (b) Define "Taguchi's Loss Function". [[CO6](Remember)/HOCQ]
- (c) Illustrate in brief the concept of Taguchi's three design components. [[CO6](Understand/HOCQ)]
- 4 + 3 + 5 = 12**
3. (a) What do you understand by "Customer Satisfaction" in the context of TQM. [[CO1](Remember/LOCQ)]
- (b) Describe the methods of "Customer Satisfaction". [[CO1](Understand/HOCQ)]
- (c) What are the ways of "Customer Satisfaction?" [[CO1](Analyse/IOCQ)]
- 5 + 4 + 3 = 12**

Group - C

4. (a) Discuss the quality tool 'Cause and Effect diagram' with an example. [[CO1](Remember /LOCQ)]
- (b) Briefly discuss the steps required to implement 5S in an organisation. [[CO2](Remember/LOCQ)]
- (c) Describe the benefits of using Kaizen. [[CO3](Understand/IOCQ)]
- 4 + 6 + 2 = 12**
5. (a) Mention the advantages of QFD. [[CO3](Understand /IOCQ)]
- (b) Briefly discuss the concept of PDCA cycle for continuous improvement in quality as modified by Deming. [[CO2](Remember/LOCQ)]
- (c) What do you mean by - 'Quality Control Circles'. [[CO3](Apply/IOCQ)]
- 4 + 6 + 2 = 12**

Group - D

6. (a) Enumerate the major objectives of ISO 9000. [[CO3](Understand/IOCQ)]
 (b) Briefly discuss the elements of QMS. [[CO3](Remember/LOCQ)]
6 + 6 = 12
7. (a) Discuss in brief the two specific areas of ISO 14000 Standards. [[CO4](Remember/HOCQ)]
 (b) Mention the relevant points pertaining to the requirements of ISO 14000. [[CO4](Analyse/LOCQ)]
6 + 6 = 12

Group - E

8. (a) Samples of size 100 were taken from mass production of a product and the average of sample means was found to be 40 cm. It is known from past experience that it is reasonable to take 13 cm as the population standard deviation. Determine the control limits. [[CO5](Evaluate/HOCQ)]
 (b) In a factory 20 samples of 5 units each were taken. The population mean was found to be 25 cm and the sum of the ranges for 20 samples is 130 cm. Find the control limits. A_2 for $n=5$ is 0.58. [[CO5](Analyse/HOCQ)]
6 + 6 = 12

9. (a) The number of customer complaints received daily by an organization is given below :

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Complaints	2	3	0	1	9	2	0	0	4	2	0	7	0	2	4

Does it mean that the number of complaints is under statistical control? Explain a control scheme for the future. [[CO5](Evaluate/HOCQ)]

- (b) The samples of different sizes were taken and the number of defects in each sample is noted below:

Sample No.	1	2	3	4	5	6	7	8	9	10
Sample size	100	300	200	150	200	250	300	150	100	250
No of defectives	7	12	6	5	18	10	18	6	3	20

Draw a control chart for fraction defectives taking $\pm 3\sigma$ control limits.

[[CO5](Evaluate/HOCQ)]
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	34.38	21.87	43.75

Course Outcome (CO):

After the completion of the course students will be able to

- CO 1** Define and measure quality, distinguish between quality control and quality assurance
- CO 2** Explain various quality control tools and their uses to improve quality
- CO 3** Differentiate between product quality and system quality, awareness of various ISO 9000 system standard

- CO 4** Understand the importance of ISO 14000 environment management system and its implication
- CO 5** Apply various quality control charts, operating characteristics curve for quality improvement
- CO 6** Define process capability, apply the principles of design of experiments, Taguchi Methodology and six sigma

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*