QUALITY CONTROL & MANAGEMENT
(MECH 4129)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

   (i) Which quality management programme is related to the maintenance of plants and equipments?
   (a) Environmental management systems   (b) Fault tree analysis
   (c) Failure mode effect analysis   (d) Total productive maintenance.

   (ii) Process inspection is associated with
   (a) Prevention costs   (b) Appraisal costs
   (c) Internal failure costs   (d) External failure costs.

   (iii) Who developed the concept of the "cost of quality"?
   (a) Crosby   (b) Deming   (c) W. Shewhart   (d) Juran.

   (iv) A quality circle is a small group of employees made up of
   (a) 4 to 6 members   (b) 6 to 8 members
   (c) 8 to 10 members   (d) 25 to 30 members.

   (v) When the process capability is more than the specified tolerance, the rejections are
   (a) less   (b) very high   (c) high   (d) nil.

   (vi) Which Quality Guru's work is based on "theory of variance"?
   (a) Juran   (b) Crosby   (c) Deming   (d) Taguchi.

   (vii) The core values and concepts necessary to sustain a total quality environment are
   (a) Customer driven quality
   (b) Leadership
   (c) Continuous improvement and learning
   (d) Commitment to customers.

   (viii) ISO 14011 is a part of
   (a) Environmental management system
   (b) Quality management system
   (c) Environmental auditing
   (d) Environmental performance evaluation.

(ix)   The control chart for number of defects per sample is
(a) p-chart   (b) np-chart   (c) C-chart   (d) R-chart.

(x)   Quality function is the responsibility of
(a) Production department   (b) Quality control department
(c) Inspection department   (d) Everybody work in the organisation.

Group - B

2. (a)   Define the term TQM. Mention few of the roles of senior management in TQM.
[(CO1)(Understand/LOCQ)]
    (b)   Describe the four major categories of costs associated with quality management.
[(CO2)(Remember/LOCQ)]
6 + 6 =12

3. (a)   Narrate briefly the necessity of "Customer Retention" in an established organisation.
[(CO2)(Remember)/LOCQ)]
    (b)   Write short notes on the following "Quality Gurus" with respect to their country of origin and their contribution towards enhancement of quality.
(i) Edward Deming (ii) Kaoru Ishikawa (iii) Philip Crosby.   [(CO1)(Remember)/LOCQ]
6 + 6 = 12

Group - C

4. (a)   Explain the following QC tools used for improving the quality of an organization:
(i) Pareto Analysis (ii) Cause and Effect Diagram (iii) Histogram.
[(CO2)(Analyze)/LOCQ)]
    (b)   Mention briefly the elements that are associated with the 5-S principles to implement "Kaizen".   [(CO2)(Remember)/IOCQ)]
6 + 6 = 12

5. (a)   Briefly discuss the concept of PDCA cycle for continuous improvement in quality as modified by Deming.   [(CO2)(Understand/LOCQ)]
    (b)   Mention the advantages of QFD.   [(CO3)(Understand/IOCQ)]
6 + 6 = 12

Group - D

6. (a)   Enumerate the major objectives of ISO 9000.   [(CO3)(Remember)/LOCQ]
    (b)   Discuss in brief the elements of Quality Management System (QMS).
[(CO3)(Remember) /IOCQ]
6 + 6 = 12

7. (a)   Mention the relevant points pertaining to the requirements of ISO 14000.
[(CO4)(Understand/LOCQ)]
    (b)   Discuss in brief the two specific areas of ISO 14000 series standards.
[(CO4)[Remember/IOCQ]
6 + 6 = 12

Group - E

8. (a) During an inspection of equal length of clothes, the following are the number of defects observed:

   2   3   4   0   5   6   7   4   3   2

   Draw a control chart for the number of defects and comment on it.

   [(CO5)(Evaluate)/IOCQ)]

   (b) An inspection of 10 samples of size 400 each from 10 lots reveals the following number of defectives:

   17   15   14   26   9   4   19   12   9   15

   Calculate the control limits for the number of defective units. Plot on the graph the usual sample number and sample characteristics. State whether the process is under control or not.   [(CO5)(Evaluate)/HOCQ)]

   6 + 6 = 12

9. (a) Determine the control limits for $\bar{X}$ and R charts if $\sum \bar{X}$ = 357.50, $\sum R$ = 9.90, Number of subgroups = 20. It is given that A_2 = 0.18, D_3 = 0.41, D_4 = 1.59 and d_2 = 3.735. Also, find the process capability.   [(CO5)(Evaluate)/HOCQ)]

   (b) The design specifications for a component are 100 ± 0.5 mm, where as the process report shows that the process average is 99.9 mm and standard deviation is 0.18. Do these figures call for any action by anyone? What action is necessary and by whom?

   [(CO5)(Evaluate)/HOCQ)]

   6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	25	62.5	12.5

Course Outcome (CO):

At the end of the course, a student 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