TOTAL QUALITY MANAGEMENT & ASSURANCE
(CHEN4282)

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

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
__any 5 (five)__ from Group B to E, taking __at least one__ 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)   Process control chart makes use of the data involving
          (a) mean and dispersion   (b) only mean
          (c) only dispersion   (d) only customers specification.

   (ii)   Fish-bone diagram is used for the purpose of
          (a) work-study and motion-study
          (b) finding out the root causes of a problem
          (c) estimating the weightage of the individual factors
          (d) sorting out major factors responsible for a problem.

   (iii) Pareto analysis is a statistical technique in decision making that is used for
          (a) selection of a limited number of tasks that produce significant overall effect.
          (b) overall examination of the total process for fault finding
          (c) failure mode analysis
          (d) fault tree analysis.

   (iv)   The 6σ spread between the control limits in process control chart corresponds to the measure of conformance as
          (a) 95.5%   (b) 99.73%   (c) 98.55%   (d) 100%.

   (v)   If the customer's specification limits are separated by 8σ, the process capability (Cp) will be
          (a) 1   (b) 1.66   (c) 1.33   (d) 2.

   (vi)   The 95% confidence interval means the following % level of significance
          (a) 5   (b) -5   (c) 100   (d) 0.

   (vii) The term Quality (Q) is related to performance (P) of the product and expectation of the customer (E) as under
          (a) $P \times E$ (b) P/E   (c) E/P   (d) P + E.

   (viii) If an event may happen in two ways and fail to happen in three ways, and all these ways are mutually exclusive and equally likely to occur, then the probability of success is
          (a) 100%   (b) 60%   (c) 40%   (d) 66%.

   (ix)   ISO 14000 quality standard deal with
          (a) installation & production
          (b) environmental management
          (c) implementation of quality assurance procedures
          (d) industrial safety operations.

   (x)   RMS deviation is equal to standard deviation when deviations are taken as differences between the data and the
          (a) individual data   (b) mean
          (c) range   (d) any arbitrary value.

Group – B

2. (a)   Differentiate between variables and attributes as quality parameter.

   (b)   Write down the different steps in calculating and plotting an X bar and R chart for variable data and draw a control chart for variables with mean $(\overline{X})$ and range (R) with control limits and specification limits.

   (c)   Explain the assignable and non-assignable causes of variability in the process control activities in a quality system.
          2 + 6 + 4 = 12

3. (a)   What is the objective of Pareto analysis?

   (b)   Analyse the following data table following the method of Pareto analysis by pictorially presenting the derived information from the data to identify the vital 20% causes that need to be taken care of to bring about an 80% overall improvement.

Causes	Frequency in %	Cumulative Frequency in %
Technical Failure	42	42
Workforce Problems	35	77
Environmental Factors	12	89
Shortage of resources	8	97
Government Approval	3	100

          4 + 8 = 12

Group – C

4. (a) Draw a $\bar{\bar{X}}$ & $\bar{R}$ process control chart with following data set as given in the table for a manufacturing organisation and comment on the state of control in the process.

Sub groups No. / samples	1	2	3	4	5	6	7	8	9
X_1	15.3	14.4	15.3	15	15.3	14.9	15.6	14	14
X_2	14.9	15.8	15.1	14.8	16.4	15.3	16.4	15.8	15.2
X_3	15	14.8	15.3	16	17.2	14.9	15.3	16.4	13.6
X_4	15.2	15.6	18.9	15.6	15.5	16.5	15.3	16.4	15
X_5	16.4	14.9	14.9	15.4	15.5	15.1	15	15.3	15

(b) The following table gives the values of the constants A2 to be used for setting the limits of control against the sample size:

n	2	3	4	5	6	7	8	9	10
A_2	1.88	1.023	0.729	0.577	0.483	0.419	0.373	0.337	0.308
D_4	3.627	2.574	2.282	2.114	2.004	1.924	1.864	1.816	1.777

What is the significance of control limits in a process control chart?

8 + 4 = 12

5. (a) How would you draw line of comparison of definition or perception of quality between the manufacturing sector and service sector?

(b) Enumerate 7-S principles for Continuous Process Improvement known as CPI-7 cycle used in the industry.

(c) What is understood by TQM? Explain the principles and key elements of TQM. Mention the benefits of TQM.

4 + 4 + 4 = 12

Group – D

6. (a) Define and enumerate the process capability Cp and Cpk of a process and compare to the target.

(b) Define consumer's risk and producer's risk.

(c) Define AOQL, AQL & LTPD.

4 + 4 + 4 = 12

7. (a) What are the merits and demerits of 'Complete Enumeration' and 'Sampling Inspection' of the quality characteristic of a population of products or services?

(b) What are Sampling and Non-Sampling errors?

(c) In a factory for manufacturing machine parts, the process control chart was designed from the following results of inspections as given in table below:

Date/ Sample	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	8.7	8.8	8.1	9.1	8.7	8.5	8.8	8.7	8.6	9.1	8.4	8.9	8.6	8.9	8.5
2	8.5	8.9	8.5	8.8	8.8	8.1	8.7	8.3	8.4	8.8	8.6	9.1	8.9	9.1	8.1
3	8.8	8.5	8.6	8.5	8.9	8.4	8.9	8.5	8.5	8.6	8.2	8.9	8.5	8.5	8.9
4	8.4	8.9	8.9	8.6	8.5	8.6	8.6	8.7	8.5	8.2	8.5	8.6	8.1	8.7	9.1
5	8`2	8.6	8.6	8.4	8.7	8.6	8.6	9.1	8.9	8.4	8.8	8.8	8.6	8.6	8.9

Draw a $\bar{\bar{X}}$ & $\bar{R}$ control chart and comment on the state of control.

4+ 2 + 6 = 12

Group – E

8. (a) Differentiate between conventional quality and total quality management. What are the concepts of six sigma?

(b) Discuss about the ISO 9000 family of standards in regard to implementation of TQM.

6 + 6 = 12

9. (a) Write short notes on any two of the following:
   (i) Quality circles
   (ii) Acceptance sampling
   (iii) SWOT analysis
   (iv) Ishikawa diagram

(b) What are different effective quality improvement methods and techniques for implementing TQM in an organisation?

(4 + 4) + 4 = 12