

**SPECIAL SUPPLE B.TECH/CHE/8<sup>TH</sup> SEM/CHEN 4242/2018**

**TOTAL QUALITY MANAGEMENT  
(CHEN 4242)**

**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) Where X is a random variable, the expected value of X is its,  
(a) mean (b) range  
(c) standard deviation (d) RMS value.
- (ii) The term quality (Q) is related to performance (P) of the product and expectation of the customer (E) as under  
(a)  $Q = P \times E$  (b)  $Q = P/E$   
(c)  $Q = E/P$  (d)  $Q = P + E$ .
- (iii) PDCA cycle is meant by  
(a) Program, Development, Control & Application  
(b) Plan, Do, Check & Act  
(c) Planning, Development, Correction & Analysis  
(d) Prepare, Document, Correct & Act.
- (iv) Pareto analysis is a statistical technique in decision making which is used for  
(a) selection of a limited number of tasks that produce significant overall effect.  
(b) reliability assessment of a product  
(c) root cause analysis  
(d) failure mode analysis.
- (v) If the customer's specification limits are separated by  $6\sigma$ , the process capability ( $C_p$ ) will be  
(a) 1 (b) 1.66 (c) 1.33 (d) 2.

- (vi) 5% level of significance of the output result of an experiment corresponds to which of the following confidence interval?  
(a) 95%                      (b) 90%                      (c) 100                      (d) 0.
- (vii) The range of the subgroup of data 2, 0, 4, 5, -1, 6 is  
(a) 8                      (b) 5                      (c) 7                      (d) 6.
- (viii) Random variations are due to  
(a) special cause                      (b) common cause  
(c) internal factors                      (d) mistakes.
- (ix) Quality circle in an industry is organized and led by  
(a) head of the department  
(b) head of the organisation  
(c) supervisor/leader  
(d) works manager.
- (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) Narrate the objectives of TQM in an organisation.  
(b) The concept of quality of products, processes and services have changed over time — Explain.  
(c) What are the tools and techniques adopted for the total quality management in an organisation?  
**4 + 4 + 4 = 12**
3. (a) Explain with an example the 80-20 rule in regard to the usefulness of Pareto diagram for problem solving.  
(b) Draw a fish-bone diagram for resolving the problem of manufacturing defect in a product with example.  
**6 + 6 = 12**

**Group - C**

4. (a) Define Process capability and explain the role of standard deviation ( $\sigma$ ) in determining process capability.

- (b) Draw and explain a process control chart with usual notations of the parameters used for identifying the assignable (special) and non-assignable (common) causes of variations in a process.

**6 + 6 = 12**

5. (a) Differentiate between the process potential index  $C_p$  and process capability Index  $C_{p_k}$  of a process.

- (b) Narrate and illustrate the differences between TQM and  $6\sigma$ , where  $\sigma$  stands for estimate of standard deviation of the population of data.

**6 + 6 = 12**

### Group - D

6. (a) Construct  $\bar{X}$  and  $R$  charts from the following table. For  $n = 5$ ,  $A_2 = 0.58$ ,  $D_4 = 2.11$ ,  $D_3 = 0$ . Comment on the state of control.

X bar	50.4	26.0	86.6	95.6	39.2	88.9	61.3	22.5	59.4
R	35	44	23	65	18	26	51	19	33
Sample No.	1	2	3	4	5	6	7	8	9

- (b) 20 successive wafers (100 chips on each) are inspected. The numbers of defects found in wafers are:

Wafer No.	1	2	3	4	5	6	7	8	9	10
No. of defects	16	14	28	16	12	20	10	12	10	17
Wafer No.	11	12	13	14	15	16	17	18	19	20
No. of defects	19	17	14	16	15	13	14	16	31	20

Draw the suitable control chart and comment.

7. (a) Draw a  $p$  chart from the following results of inspection of a lot of machine parts where the % of scraps are calculated for 1<sup>st</sup> to 15<sup>th</sup> day in a month as given in the following table:

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
% Scrap	19.1	20	17.7	15.2	21.3	16	14.9	18.3	18.9	16.2	18.8	17.5	19.2	20.1	21.5

- (b) Discuss about  $6\sigma$  as a spread for the control limit in a process control chart.

**6 + 6 = 12**

### Group - E

8. (a) Explain Sampling and Non-Sampling errors with appropriate examples?

- (b) What is sampling and explain the use of different simple sampling plans for sampling of attributes and variables.

**6 + 6 = 12**

9. (a) Write short notes on any two of the following:

(i) Kawasaki diagram (ii) Failure Mode and effect Analysis (iii)  $6\sigma$ .

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

**(3 + 3) + 6 = 12**