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4 SEM TDC STSH (CBCS) C 10 (N/O)

2025

(May/June)

STATISTICS

(Core)

Paper : C-10

(Statistical Quality Control)

*The figures in the margin indicate full marks
for the questions*

(New Course)

Full Marks : 55

Pass Marks : 22

Time : 3 hours

1. Choose the correct answer from the following alternatives : 1×5=5

(a) The faults due to assignable causes

(i) can be removed

(ii) cannot be removed

(iii) can sometimes be removed

(iv) All of the above

(2)

- (b) The relation between expected value of R and SD σ with usual constant factor is

(i) $E(R) = d_1\sigma$

(ii) $E(R) = d_2\sigma$

(iii) $E(R) = D_1\sigma$

(iv) $E(R) = D_2\sigma$

- (c) Control chart for number of defects is also known as

(i) np -chart

(ii) p -chart

(iii) C -chart

(iv) None of the above

- (d) The probability of accepting a lot with fraction defective P_t is known as

(i) consumer's risk

(ii) type-I error

(iii) producer's risk

(iv) None of the above

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(Continued)

(3)

- (e) The maximum limit of percentage defectives in a finally accepted product is called

(i) acceptance quality level (AQL)

(ii) average outgoing quality limit (AOQL)

(iii) lot tolerance percentage defective (LTPD)

(iv) All of the above

2. Answer the following questions in brief :

2×6=12

(a) Write the eight dimensions of components of quality.

(b) Distinguish between process control and product control.

(c) Distinguish between variable and attribute control chart.

(d) Define the terms specification limits and control limits.

(e) Explain the meaning of average outgoing quality (AOQ).

(f) Define six-sigma.

3. Answer any one of the following :

10

(a) Explain the concept of quality. Write the important components of quality standards set by ISO. Mention two quality gurus and their contribution in the field of SQC.

2+4+4=10

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(4)

- (b) What are the seven major SPC problem-solving tools? Explain any two of them.

5+5=10

- (c) What do you understand by control chart in statistical quality control? How can the control charts be prepared and interpreted to draw meaningful conditions?

5+5=10

4. (a) Explain clearly the basis and working of control charts for mean and range. Compare R-chart vs. sigma (σ) chart.

8+3=11

Or

- (b) Distinguish between defect and defective. Discuss the construction of p-chart when all the samples are of same size. Give some applications of c-chart.

2+7+2=11

5. (a) Discuss the following concepts in connection with sampling inspection plans :

2+2+2=6

(i) Consumer's risk

(ii) Producer's risk

(iii) LTPD

Or

- (b) Describe the techniques of sampling inspection by variables for the normal distribution case.

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(Continued)

(5)

6. Answer any one of the following : 5

(a) Explain what is single-sampling plan and double-sampling plan. Draw the flowchart for both the plans.

(b) Delineate operating characteristic (OC) curve of a sampling plan.

7. Answer any one of the following : 6

(a) Define lean manufacturing and TQM.

(b) What do you mean by VOC? Write about the necessities of voice of customers as a basic concept of six-sigma methodology. Mention some different ways of computing VOC.

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(6)

(Old Course)

Full Marks : 50

Pass Marks : 20

Time : 2 hours

1. Choose the correct answer from the following alternatives : $1 \times 5 = 5$

- (a) Using statistical tool, one can check
- (i) only chance cause
 - (ii) only assignable cause
 - (iii) both chance and assignable causes
 - (iv) None of the above
- (b) Who was the man who first introduced the concept of control chart in the arena of quality control?
- (i) Henry Grant
 - (ii) W. A. Shewhart
 - (iii) R. A. Fisher
 - (iv) G. Taguchi
- (c) LCL for R chart is given by
- (i) $D_3 \bar{R}$
 - (ii) $D_2 \bar{R}$
 - (iii) $\bar{R} - D_3 \bar{R}$
 - (iv) $D_2 R$

(7)

- (d) Acceptance sampling methodology was first developed by
- (i) H. F. Dodge and H. G. Romig
 - (ii) Motorola
 - (iii) US War Department
 - (iv) W. E. Deming
- (e) In the abbreviation of DMAIC, 'M' stands for
- (i) Measure
 - (ii) Monitor
 - (iii) Mobilize
 - (iv) None of the above

2. Answer the following questions in brief :

$2 \times 5 = 10$

- (a) Mention two types of causes of variation in a manufacturing process.
- (b) Differentiate between process control and product control.
- (c) State the criteria for detecting lack of control in Shewhart's control charts.
- (d) Explain the utility of rational subgroups in control chart.
- (e) Define six-sigma.

3. Answer any *two* from the following : $10 \times 2 = 20$

- (a) What are the control charts used for variables? Describe the construction of any one of these charts. $2+8=10$
- (b) Distinguish between defect and defectives. Explain the construction of a control chart for fraction defective. $4+6=10$
- (c) Distinguish between single- and double-sampling inspection plan in quality control. How are ASN and ATI calculated in double-sampling plan? $4+6=10$

4. Answer any *one* from the following : 10

- (a) What do you understand by acceptance sampling procedure? Explain briefly its uses.
- (b) Define lean manufacturing and total quality management (TQM). State the 5 principles of lean manufacturing.
- (c) What is DMAIC in the six-sigma process? Briefly explain each phase of DMAIC.

5. Answer any *one* from the following : 5

- (a) Historical perspective of quality control
- (b) Eight dimensions of components of quality.
