Answer any TEN of the following: **10X1=10**

1. a) What is Statistical Quality Control?

b) How is process control achieved in SQC ?

c) Mention an objective of SQC.

d) If the ratio of specified tolerance to process capability is quite large, the frequency of control chart can be reduced (TRUE/FALSE).

e) Write down the control limits for *np* chart, when standard value of *p* is known.

f) The control limits set by the consumer are known as .....

g) Mention a use of acceptance sampling plan.

h) The probability of acceptance corresponding to the acceptable quality level is .....

i) The expected sample size required to arrive at a decision about the lot is called as .....

j) If a fraction defective *p* or more in a lot is not acceptable to the consumer, then it is known as .....

k) Write down the AOQ for SSP by attributes.

l) Find out reliability of the system with four components connected in parallel having reliabilities 0.96, 0.93, 0.92 and 0.88 respectively.

PART – B

Answer any Two of the following: **2x10=20**

2. a) Distinguish between process control and product control. (5)

b) Explain probability limits and warning limits. (5)

3. a) Explain the need for rational subgroups. What are the criteria behind the selection of rational subgroups. (5)

b) What action do you suggest when the specification limits lie within the control limits. (5)

4. a) What are the criteria of lack of control with respect to control chart for variables. (5)

b) Explain chance variation and assignable variation in quality. (5)

Answer any TWO of the following: **2x10=20**

5. a) Stating the assumptions obtain limits for $\bar{x}$ and R charts when standards are not given. (5)

b) Make a comparative study of charts for attributes and charts for variables. (5)

6. a) Define fraction defective. Explain the theoretical basis of control chart for fraction defective. (5)

b) How is the choice between p and np charts made? Explain the different methods employed to deal with the problem of varying sample size in p-chart. (5)

7. a) Distinguish between a defect and a defective. Write down any two situations where C-chart is applicable. What is the significance of points that lie below the LCL on a C-Chart? (5)

b) Stating the theoretical basis, derive control limits for u-chart. (5)

Answer any TWO of the following: **2x10=20**

8. a) Derive an expression for ATI in case of SSP by attributes. (5)

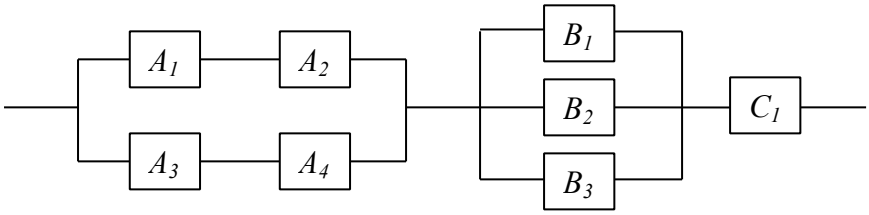
b) Explain Double Sampling Plan for attributes. (5)

9. a) How do you construct a SSP for attributes when PR, CR, AQL and LTPD are given. (5)

b) Derive the expression for OC function of SSP by variables when lower specification limit L is given and σ is known. (5)

10. a) Define reliability. Assuming exponential time to failure distribution with a constant failure rate λ, derive the expression for reliability and hence obtain the hazard function at time '*t*'. (5)

b) Assuming exponential time to failure distribution, find the system failure rate and the MTTF for the eight-component system shown below: (5)



The failure rates for the components are as follows:

$\lambda_{A1} = 0.0006$, $\lambda_{A2} = 0.0045$, $\lambda_{A3} = 0.0035$, $\lambda_{A4} = 0.0016$

$\lambda_{B1} = 0.0060$, $\lambda_{B2} = 0.0060$, $\lambda_{B3} = 0.0060$, $\lambda_{C1} = 0.005$

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STA 602.2 **Reg. No. ……**

CREDIT BASED VI SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2013

STATISTICS - VIII

STATISTICAL QUALITY CONTROL

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **10X2=20**

1. a) What is Statistical Quality Control?

b) How is product control achieved in SQC ?

c) What are chance and assignable causes of variation?

d) Distinguish between natural tolerance limits and specification limits.

e) What do you mean by rational subgroups?

f) Write down the control limits for np chart when standard value of p is known.

g) Distinguish between 'a defective' and 'a defect'. Give example.

h) What are LTPD and consumer's risk?

i) What do you mean by an ideal OC curve?

j) Distinguish between ATI and ASN.

k) Write down the AOR for SSP by attributes. What is AOQL.

l) An amplifier has an exponential time-to-failure distribution with a failure rate of 7% per 1000 hours. What is the reliability of the amplifier at 4000 hours? Find the MTTF.

PART – B

Answer any Two of the following: **2x10=20**

2. a) Distinguish between quality taken as a variable and as an attribute. Give examples. (5)

b) Explain probability limits and warning limits. (5)

3. a) What are the criteria of lack of control with respect to control chart for variables? Explain. (5)

b) What actions do you suggest when the specification limits lie within the control limits? (5)

4. a) When do you modify the control limits of $\bar{X}$ chart? Obtain the expression for the modified limits of $\bar{X}$ chart. (5)

b) How do you obtain the control limits for future analysis in $\bar{X}$ and R charts? (5)

Answer any TWO of the following: **2x10=20**

5. Clearly stating the statistical basis, derive the control limits for $\bar{x}$ – charts when standards are known and unknown. (10)

6. a) What are the merits and demerits of control charts for variables when compared to control charts for attributes? (5)

b) Stating the assumptions, derive the control limits of np-chart when the standard value is unknown. (5)

7. a) Stating the theoretical basis, derive control limits for u-chart when the standard value is known. (5)

b) Make a comparative study of R and σ charts. (5)

Answer any TWO of the following: **2x10=20**

8. a) Explain the SSP by attributes. Write down the OC function using
(i) Hyper Geometric Distribution
(ii) Binomial approach and
(iii) Poisson approximation. (5)

b) Explain the construction of SSP by attributes when AQL, LTPD, PR and CR are given. (5)

9. a) Describe a SSP by variables when lower specification limit is given and σ is known. (5)

b) Explain the construction of a SSP by variables when upper specification limit is given and σ is unknown. (5)

10. a) Derive expressions for the reliability of the system when the components are connected in series and in parallel. (5)

b) For a system with 3 components connected in parallel, determine the system reliability for 1000 hours of operation and find MTTF. Assume that all three components have an identical time-to-failure distribution that is exponential with a constant failure rate of 0.00045/hr. What is the mean time-to-failure of each component? If it is desired for the system to have a mean time-to-failure of 3500 hours, what should be the MTTF of each component? (5)

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STA 602.2 **Reg. No. ……**

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2014

STATISTICS

STATISTICAL QUALITY CONTROL

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **2X10=20**

1. a) Define quality as an attribute.

b) Mention an objective of SQC.

c) How does the process control is achieved in SQC.

d) What are specification and natural tolerance limits?

e) Mention a use of acceptance sampling plan.

f) Define a fraction defective.

g) Define LTDP.

h) Write down the AOQ for SSP by attributes.

i) Define Producer's risk.

j) Write the control limits for P chart when standard value of p is unknown.

k) What is acceptance sampling?

l) A certain component has a uniform rate of failure of per hour. Write the reliability of it for a specified period of service of 10000 hours.

PART – B

Answer any TWO of the following: **10x2=20**

2. a) Distinguish between process control and product control.

b) Explain assignable causes and chance causes of variation. **(5+5)**

3. a) What are probability limits and warning limits?

b) What action do you suggest when the specification limits lie within the control limits.

(5+5)

4. a) What are the criteria of lack of control with respect to control chart for variables.

b) What action do you suggest when the specification limits lie within the control limits? **(5+5)**

Answer any TWO of the following: **10x2=20**

5. a) Stating the assumption, obtain the limits for R and $\bar{}$ charts when standards are not given.

b) Distinguish between charts for attributes and variables. **(5+5)**

6. a) Derive the control limits for np-chart.

b) Distinguish between defect and defective. Give examples. **(5+5)**

7. a) Explain methods of constructing p-chart with varying sample size.

b) Stating the assumptions, derive the control limits for u-chart. **(5+5)**

Answer any TWO of the following: **10x2=20**

8. a) Derive the expression for ATI in case of SSP by attributes.

b) Explain the method of constructing a SSP for attributes. **(5+5)**

9. a) Write a short note on double sampling plan.

b) Derive the expression for SSP by variables when the upper specification limit *u* is given and $\bar{}$ known. **(5+5)**

10. a) Explain minimal path and hazard function.

b) Derive an expression for the reliability of the system when the components are connected in series and in parallel. **(5+5)**

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STA 602.2 **Reg. No. ……**

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2015

STATISTICS – VIII

STATISTICAL QUALITY CONTROL

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **2X10=20**

1. a) Define 'Quality'.

b) A peculiar pattern of points within the control limits is indicative of …….

c) Define quality as an attribute.

d) Distinguish between defect and defective.

e) If μ and σ are the process mean and S.D., then the control limits are unknown as ……..

f) What do you mean by acceptance sampling.

g) The small fraction defective p on the basis of which a lot is not rejected except for a small number of time is known as ……

h) What is meant by O.C. function of a sampling plan.

i) What is AOQL?

j) Write down the ATI for SSP by attributes.

k) Write down the central limits for u-chart when standard value of u is not given.

l) For a system with 4 components connected in parallel, determine the MTTF of the system, assuming that all 4 components have an identical time to failure distribution that is exponential with a constant failure rate of 0.0005/hr.

PART – B

Answer any TWO of the following: **10x2=20**

2. a) What are the objectives of SQC.

b) Distinguish between process control and product control. **(5+5)**

3. a) Giving suitable example distinguish between chance causes of variation and assignable causes of variation.

b) What action do you suggest when the specification limits lie outside the control limits.

(5+5)

4. a) Explain specification limits and natural tolerance limits.

b) What are the criteria of lack of control with respect to control chart for variables. **(5+5)**

Answer any TWO of the following: **10x2=20**

5. a) Make a comparative study of charts for attributes and charts for variables.

b) Stating the assumption, obtain the limits for $\bar{X}$ and R charts when standards are known. **(5+5)**

6. a) Explain the construction of p-chart with variable sample size.

b) Explaining the statistical basis, derive the control limits for *np* chart. **(5+5)**

7. a) Explain the statistical basis of a control chart for number of defects. Mention any two situations where c-chart is applicable.

b) Starting the assumptions, derive the control limits for s-chart when standards are known and unknown. **(5+5)**

Answer any TWO of the following: **10x2=20**

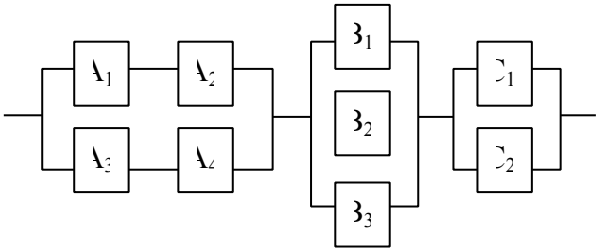
8. a) Derive the expression for AOQ in case of SSP for attributes.

b) Explain double sampling plan for attributes. **(5+5)**

9. a) Stating the assumptions and approximation construct SSP by variables, when upper specification limit is given and σ is unknown.

b) Mention the merits and demerits of variable sampling plan. **(5+5)**

10. a) Find the reliability of the system shown below:



b) Describe the life cycle of a complex product. **(5+5)**

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STA 602.2 Reg. No. .....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2016

STATISTICS – VIII

STATISTICAL QUALITY CONTROL

Time: 3 Hrs **Max. Marks: 80**

PART - A

Answer any TEN of the following: **2X10=20**

1. a) Explain the role of control charts in process control.
   b) Mention any two uses of Statistical Quality Control.
   c) What are specification limits?
   d) Define a defect.
   e) What is product control?
   f) What is indifference quality?
   g) Define AOQL.
   h) Write down the formula for AOQ for SSP by attributes.
   i) If $U-L=6\sigma^1$, what is your conclusion about process capability?
   j) What is meant by an ideal OC curve?
   k) State any one situation where C-Chart is used.
   l) Find out reliability of the system with four components connected in parallel having reliabilities 0.96, 0.93, 0.92 and 0.88 respectively.

PART – B

Answer any TWO of the following: **10x2=20**

2. a) What are the objectives of SQC?
   b) Distinguish between quality taken as a variable and quality taken as an attribute. **(5+5)**

3. a) Explain the criteria behind the selection of subgroups.
   b) Explain the significance of 3 sigma limits in control chart theory. **(5+5)**

4. a) Explain the criteria for lack of control on $\bar{x}$ and R charts.
   b) Explain probability limits and warning limits. **(5+5)**

Answer any TWO of the following: **10x2=20**

5. Discuss the steps involved in the construction of $\bar{x}-R$ charts. **(10)**

6. a) Outline the steps in the construction and the analysis of a p-chart.
   b) How is the choice between p and np charts made? **(5+5)**

7. a) Explain the construction and analysis of C-Chart.

   b) Stating the theoretical basis, derive control limits for U-chart. **(5+5)**

Answer any TWO of the following: **10x2=20**

8. a) What are the characteristics of a good sampling plan?

   b) Explain Double Sampling Plan for attributes. **(5+5)**

9. a) How do you construct a SSP for attributes when PR, CR, AQL and LTPD are given.

   b) Derive the expression for OC function of SSP by variables when lower specification limit L is given and σ is unknown. **(5+5)**

10. a) Define reliability. Derive the expression for reliability and the hazard function at time 't' by assuming exponential time to failure distribution with a constant failure rate λ.

   b) For a system with 3 components connected in parallel determine the system reliability for 1000 hours of operation and find MTTF. Assume that all three components have an identical time-to-failure distribution that is exponential with a constant failure rate of 0.00045/hr. What is the mean time to failure of each component? If it is desired for the system to have a mean time to failure of 3500 hours, what should be the MTTF of each component. **(5+5)**

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