**Total No. of Questions : 4]**                                        **SEAT No. :**

**P906**                                                    **[Total No. of Pages : 3**

**[5315]-603**
**T.Y.B.Sc.**
**STATISTICS (Principal)**
**ST - 343 : Statistical Process Control (Off line Methods)**
**(2008 Pattern) (Semester IV)**

*Time : 2 Hours]*                                             *[Max. Marks : 40*
*Instructions to the candidates:-*
  *1)*  *All questions are compulsory.*
  *2)*  *Figures to the right indicate full marks.*
  *3)*  *Use of scientific calculator and statistical tables is allowed.*
  *4)*  *Symbols and abbreviations have their usual meaning.*

*Q1)* **Attempt each of the following:**

  a)  Choose the correct alternative in each of the following:          **[1 each]**

   i)  In a single sampling plan, that expression for Average Outgoing
       Quality (AOQ) is given by

       A)  AOQ =[(n-N)/N]. P.Pa    B)  AOQ =[N/(n-N)]. P.Pa

       C)  AOQ =[(N-n)/N]. P.Pa    D)  AOQ =[Nn/(N-n)]. P.Pa

   ii)  If T is life time of a component then reliability of the component at
        t is

        A)  $P(T = t)$               B)  $P(T < t)$
        C)  $P(T > t)$               D)  $P(T / T > t)$

   iii)  For a coherent binary system of three components total number of
         state vectors are

         A)  2                       B)  3

         C)  8                       D)  9

   iv)  From OC curve of a single sampling plan which of the following
        cannot be determined?

        A)  Producer's risk

        B)  Consumer's risk

        C)  AOQL

        D)  Probability of acceptance at quality at P

                                                              *P.T.O.*

b) In each of the following, state whether the given statement is true or false. **[1 each]**

    i) Parallel system is a coherent system.

    ii) In case of single sampling plan Average Total Inspection (ATI) always lies between n and N.

c) Define the following terms: **[1 each]**

    i) Minimal cut vector

    ii) Decreasing Failure Rate (DFR)

d) i) Draw the fault tree diagram for the following reliability **[1]**
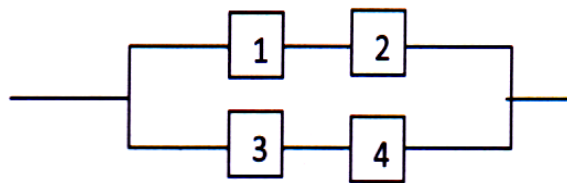


    ii) Explain the procedure of single sampling plan. **[1]**

**Q2)** Attempt **any two** of the following **[5 each]**

a) For a single sampling plan n = 100, c = 3 the lot is large as compared to sample size. Find the value of average outgoing quality AOQ if submitting lot has P = 0.03

b) Explain: normal, reduced and tightened inspection.

c) Define reliability of a coherent system. Obtain reliability of parallel system with three components if all the components have same reliability.

**Q3)** Attempt **any two** of the following: **[5 each]**

a) Derive the expression of ATI in double sampling plan.

b) For the structure function $1-(1-X_1 X_2)(1-X_3 X_4)$ draw a reliability block diagram. Also find path vectors and path sets.

c) Write a short note on ISO.

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*Q4)* Attempt **any one** of the following:

    a)   i)   Define hazard rate r(t). Show that $r(t) = \dfrac{f(t)}{\bar{F}(t)}$ ($\bar{F}(t)$ is survival

              function)

        ii)  Distinguish between 100% inspection and sampling inspection.

                                       **[5 + 5]**

    b)   i)   For a double sampling plan with N =2000, $n_1 = 60$, $C_1 = 1$, $n_2 = 100$, $C_2 = 3$, find ATI if lots of quality p = 0.04 are submitted for inspection.

        ii)  Write note on acceptance sampling plan with rectification.

                                        **[5 + 5]**

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