ISSN: 0974-5823 Vol. 7 No. 1 January, 2022

International Journal of Mechanical Engineering

RELIABILITY SAMPLING PROCEDURE FOR HIGH PRICED PRODUCTS

V. Jemmy Joyce
Department of Mathematics, Karunya Institute of Technology and Sciences, Coimbatore, India.

K. Rebecca Jebaseeli Edna
Department of Mathematics, Karunya Institute of Technology and Sciences, Coimbatore, India.

G. Sheeba Merlin
Department of Mathematics, Karunya Institute of Technology and Sciences, Coimbatore, India.

Abstract:

Life testing for very high priced products with least of sample size can be done using the procedure of sampling plan designed in this paper. The required sample size for various of operating characteristic function using new design procedure is obtained using program in OCTAVE based on Lomaxdistribution and is compared with sample size obtained based on exponential distribution.

Keywords: Lomax distribution, Exponential distribution, operating characteristic function, sample size

1. Introduction:

In order to carry out life testing of high priced products with least of sample size. a new approach is designed in this paper. Double sided modified chain [1] Reliability sampling procedure is designed with Lomax distribution and is examined with sample size of double sided modified chain with exponential distribution

2. Formulation of the sampling plan:

The plan is formulated using the terms K, I, J, s, where k is test index that is defined as ratio of test time to average life of high priced products, I, J are index for chaining, s is the sample size. Take a sample of size's' and put them into life test based on test index, 'k', accept the lot, if the there are no failure units and reject the if there is more than one failure. Accept the loth if there is only one failure and when no failures occurred in preceeding 'I' and succeeding 'J'samples each of size 's'

3. Operating characteristic function:

Based on above procedure of sampling, the probability of acceptance using Lomax distribution is given by

$$P_a(p) = \exp(-s(1-(1+k)^{-2}))(1+s(1-(1+k)^{-2})(\exp(-s(1-(1+k)^{-2})(I+J)) \quad (1)$$

Based on above procedure of sampling, the probability of acceptance using exponential distribution is given by

$$P_a(p) = \exp(-s(1-\exp(-k))(1+s(1-\exp(-k))\exp(-s(1-\exp(-k))(I+J)) \quad (2)$$

Table 1: For I=1, J=1, the values of sample size 's' obtained using equation(1) and (2) are tabulated below for various values of test index 'k'

P_a	K=0.008		K=0.009		K=0.01		K=0.02		K=0.03		K=0.04	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
0.97	1	2	1	2	1	2	1	2	1	1	1	1
0.95	2	3	2	3	2	3	1	2	1	1	1	1
0.93	2	4	2	4	2	4	2	2	1	2	1	1
0.9	3	7	2	6	2	5	2	3	1	2	1	2
0.87	4	9	3	9	3	7	2	3	2	2	1	2
0.85	5	11	4	10	4	8	2	4	2	3	1	2
0.83	5	12	4	11	5	9	3	5	2	3	2	3
0.8	6	14	5	12	5	10	3	6	2	4	2	3
0.75	8	17	5	15	6	14	3	7	3	5	2	4

Table 2: For I=2, J=2, the values of sample size ‘s’ obtained using equation(1) and (2) are tabulated below for various values of test index ‘k’

P_a	K=0.008		K=0.009		K=0.01		K=0.02		K=0.03	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
0.93	1	2	1	2	1	2	1	1	1	1
0.9	2	3	2	3	1	3	1	2	1	1
0.87	2	4	2	3	2	4	1	2	1	2
0.85	3	5	3	5	2	4	1	2	1	2
0.83	4	6	3	6	2	4	2	3	1	2
0.8	4	7	3	6	3	4	2	3	1	2
0.75	5	9	4	8	3	6	2	4	2	2
0.7	6	11	5	10	3	8	3	4	2	3
0.65	7	13	6	12	4	10	3	6	2	3

Table 3: For I=3, J=3, the values of sample size ‘s’ obtained using equation(1) and (2) are tabulated below for various values of test index ‘k’

P_a	K=0.007		K=0.008		K=0.009		K=0.01		K=0.02	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
0.9	2	2	1	2	1	2	1	2	1	1
0.87	2	4	2	3	2	3	2	3	1	2
0.85	2	4	2	4	2	3	2	3	1	2
0.83	3	5	2	4	2	4	2	3	1	2
0.8	3	6	3	5	2	4	2	4	1	2
0.75	3	7	3	6	3	6	3	5	2	3
0.7	4	8	4	7	3	7	3	6	2	3
0.65	5	10	4	9	4	8	4	7	2	4
0.6	6	12	5	10	5	10	4	8	3	5
0.5	8	16	7	13	5	13	6	11	3	6

Table 4: For I=4, J=4, the values of sample size ‘s’ obtained using equation(1) and equation(2) are tabulated below for various values of test index ‘k’

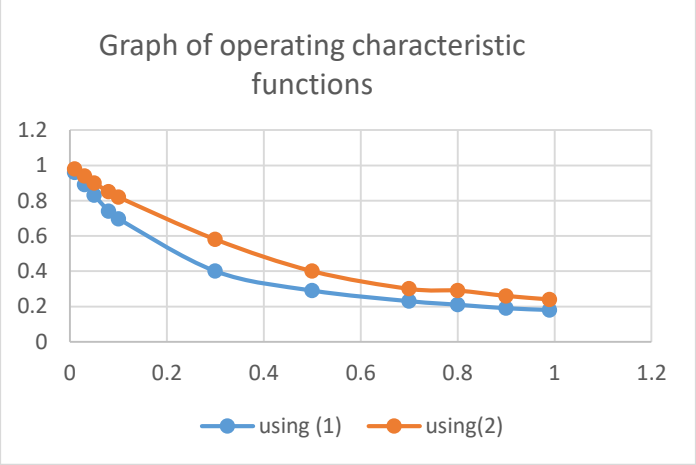
P_a	K=0.006		K=0.007		K=0.008		K=0.009		K=0.01	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
0.9	1	2	1	2	1	2	1	2	1	2
0.87	2	3	2	3	2	3	2	2	1	2
0.85	2	4	2	3	2	3	2	3	1	2
0.83	2	4	2	4	2	3	2	3	2	3
0.8	3	5	2	4	2	4	2	3	2	3
0.75	3	6	3	5	3	5	2	4	2	4

0.7	4	7	3	6	3	6	3	5	3	5
0.65	5	8	4	8	4	7	3	6	3	6
0.6	6	10	5	9	4	8	4	7	4	7
0.5	7	14	6	12	6	11	5	10	5	9

Table 5: For I=5, J=5, the values of sample size 's' obtained using equation(1) and equation(2) are tabulated below for various values of test index 'k'

P_a	K=0.005		K=0.006		K=0.007		K=0.008		K=0.009	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
0.9	1	2	1	2	1	2	1	2	1	1
0.87	2	3	2	3	1	2	1	2	1	2
0.85	2	4	2	3	2	3	1	2	1	2
0.83	2	4	2	3	2	4	2	3	1	2
0.8	3	5	3	4	2	4	2	3	2	3
0.75	3	6	3	5	2	4	2	4	2	4
0.7	4	7	4	6	3	5	3	5	2	4
0.65	5	8	5	7	3	6	3	5	3	5
0.6	5	9	5	8	4	7	4	7	3	6
0.5	7	13	7	11	5	9	5	9	4	8

4. Plot of operating characteristic function



5. Example: Explain the Reliability sampling procedure of an high priced product using Lomax distribution with test index 0.008, i=2, j=2 and Pa=0.8

Solution: From table 2, the sample size is 4, Take a sample of size '4' and put them into life test based on test index, 'k' =0.008, accept the lot, if the there are no failure units and reject the if there is more than one failure. Accept the lot if there is only one failure and when no failures occurred in preceeding '2' and succeeding '2'samples each of size '4'

Conclusion:

The above table values of sample size of Reliability sampling procedure clearly shows that the sample size is less based on Lomax distribution than the exponential distribution and hence the new procedure designed in formulation of the plan is applicable for high priced products

References:

[1] K. REBECCA JEBASEELI EDNA, V.JEMMY JOYCE, S. DEVA ARUL: *Mixed Sampling Plan Indexed Through Aql, Lql With Two Sided Complete Chain Sampling As Attribute Plan*, · International Journal Of Applied Engineering Research (20), 2014,7143-7148

[2] REBECCA JEBASEELI EDNA, K AND JEMMY JOYCE, V: *Mixed two sided complete chain sampling Plans for maximum allowable variance*, International Journal of Mechanical and Production Engineering Research andDevelopment,Vol. 8, Issue 3, 2018, 599-602

[3]JEMMY JOYCE, V. AND REBECCA JEBASEELI EDNA, K.: Designing*and Selection of Reliability based Sampling plans*, International Journal of Mechanical and Production Engineering Research and Development, Vol. 8, Issue 4, 2018, 343 – 348

[4] JEMMY JOYCE, V. AND REBECCA JEBASEELI EDNA, K.: Designing *Modified Chain Reliability Sampling Plans Based On Dagum Distribution*, International Journal of Engineering and Advanced Technology, Vol. 8, Issue 4, 2019, 365 – 366

[5]REBECCA JEBASEELI EDNA, K AND JEMMY JOYCE, V.**: *T**he Designing And Selection of Mixed Modified Chain Sampling Plan with Variance Criterion:*** International Journal of
Mechanical and Production Engineering Research and Development, Vol. 9, Issue 3, 2019, 855 – 860

[6] JEMMY JOYCE, V. AND REBECCA JEBASEELI EDNA, K.:*Algorithm for Reliability Sampling Plans of Expensive Products*, Test Engineering and Management, volume 83, 2020, 1271-1273

[7] Singh, Brijesh P., Shiwani Tiwari, and Sweta Singh. "Estimation of Expected Duration of Stay of Tourists in the Cultural and Religious Capital of India." International Journal of Mathematics and Computer Applications Research (IJMCAR) 9.1, Jun 2019, 51-58

[8] Krishna, G. Sai, and G. Veerendra. "Flood frequency analysis of Prakasam Barrage Reservoir Krishna District, Andhra Pradesh using Weibull, Gringorten and L-moments formula." Int. J. Civil. Struct. Env. Infr. Eng. Res. Dev 5 (2015).

[9] Joyce, V. Jemmy, and K. Rebbeca Jebaseeli Edna. "Designing and Selection of Reliability Based Sampling Plans." International Journal of Mechanical and Production Engineering Research and Development (IJMPERD) 8.4 (2018): 343-348.

[10] Hymavathi, T., and W. Sridhar. "Numerical study of flow and heat transfer of casson fluid over an exponentially porous stretching surface in presence of thermal radiation." International Journal Of Mechanical And Production Engineering Research And Development 8.4 (2018): 1145-54.

[11] Singh, Niraj K., and Brijesh P. Singh. "Study of distance associated with marriage migration." Int. J. Math. Comp. Appl. Res 5 (2015): 111-116.