Journal of Modern Mathematics and Statistics 8 (1): 8-13, 2014
ISSN: 1994-5388

Acceptance Sampling Plan from Truncated Life Tests Based on Exponentiated Inverse Rayleigh Distribution

[1]G.V. Sriramachandran and [2]M. Palanivel
[1]Department of Mathematics,
College of Engineering and Technology, 642 003 Pollachi,
[2]Department of Statistics, Government Arts College, 641 007 Coimbatore, India

Abstract: In this study, an acceptance sampling plan is developed for a truncated life test when the life time of a product follows exponentiated inverse Rayleigh distribution. The minimum sample size required and the acceptance number is determined for various combinations of shape parameter of the exponentiated inverse Rayleigh distribution when the consumer's risk and the test termination time are specified. The operating characteristic values according to various quality levels are also obtained. The results obtained are compared with ordinary inverse Rayleigh distribution.

Key words: Consumer's risk, producer's risk, truncated life tests, exponentiated inverse Rayleigh distribution, inverse Rayleigh distribution, operating characteristic value

INTRODUCTION

Quality control is a procedure or set of procedures intended to ensure that a manufactured product adheres to a defined set of quality criteria or meets the requirements of the client or customer. Acceptance sampling plan is used to determine whether to accept or reject the production lot. A decision to accept or reject the lot is made based on the random sample taken from the lot and by testing the number of defective items present in the sample. The lot is accepted if the sample contains defective items within the prescribed acceptance number, otherwise the lot is rejected. Hence, an acceptance sampling plans consists of the number of units on test (n) and the acceptance number (c) such that the lot is accepted if the number of defective items in the lot is less than or equal to c, otherwise it is rejected.

In time truncated life tests plans, the process is to terminate the test at a pre-fixed time and record the number of failures that occurred during that time period. In many situations, the quality of a product is measured through the life Time (T) and the variance or the scale parameter of the distribution of T may serve as a quality parameter. If the units in the lot are classified as defective or non-defective based on a life testing experiment then the acceptance sampling plan must consider a third element, i.e., the ratio t/σ_0 where, t is the pre-fixed test time and σ_0 is the specified mean or median life time. Thus, a random variable that represents the life time of the inspected unit is related to an acceptance sampling based on truncated life tests. In time truncated life tests plans, researchers have to determine the smallest value of n, the sample size to ensure a mean life time when the life test is terminated at a pre assigned time (t) and when the number of failures observed does not exceed a given acceptance number (c). The decision is to accept the lot only if the specified mean life time can be established with a pre assigned probability (p^*) which provides protection to consumers.

In the literature survey, Sobel and Tischendrof (1959) developed truncated life tests of this type for the exponential distribution. Goode and Kao (1961) developed the sampling plans based on the truncated life test for the Weibull distribution with known shape parameter. Gupta and Groll (1961) developed the sampling plans based on the truncated life tests for the gamma distribution with known shape parameter. Tsai and Wu (2008) developed truncated life tests with Inverse Gaussian data. Balakrishnan *et al*. (2007) developed truncated life tests based on the generalized Birnbaum-Saunders distribution. Baklizi and El-Masri (2004) developed acceptance sampling based on truncated life tests in the Birnbaum-Saunders model. Lio *et al*. (2010) developed acceptance sampling plans from truncated life tests based on Birnbaum-Saunders distribution for percentiles. Srinivasa *et al*. (2011) developed an economic reliability test plan for Marshall-Olkin extended exponential distribution. Epstein

Corresponding Author: G.V. Sriramachandran, Department of Mathematics, College of Engineering and Technology, 642 003 Pollachi, India

(1954) developed truncated life test in the exponential case. Rosaiah and Kantam (2005) developed an acceptance sampling based on the inverse Rayleigh distribution. Cordeiro *et al*. (2013) developed the exponentiated Generalized class of distributions.

In this study, based on Cordeiro *et al*. (2013), researchers have developed an acceptance sampling plan based on truncated life test, if the life time of the product follows exponentiated inverse Rayleigh distribution.

The exponentiated inverse Rayleigh distribution: The cumulative distribution function and probability density function of the inverse Rayleigh distribution are given by:

$$G(z)=\begin{cases} e\, z^{-\frac{1}{2}} & \text{for } z>0 \\ 0 & \text{for } z\le 0 \end{cases} \tag{1}$$

If a scale parameter $\sigma>0$ is introduced, the cumulative distribution function of inverse Rayleigh distribution is given by:

$$F(t,\sigma)=e^{-(\sigma/t)^2} \quad \text{for } t>0 \tag{2}$$

The cumulative distribution function (cdf) of exponentiated inverse Rayleigh distribution is defined by:

$$F(t,\alpha,\beta,\sigma)=\left\{1-\left[1-\exp^{-(\sigma/t)^2}\right]^{\alpha}\right\}^{\beta} \quad \text{for } t>0 \tag{3}$$

The probability density function (pdf) of inverse Rayleigh distribution is given by:

$$f(t,\alpha,\beta,\sigma)=\frac{2\alpha\beta\sigma^2 e^{-\sigma^2/t^2}\left(1-e^{-\sigma^2/t^2}\right)^{\alpha-1}\left(1-\left(1-e^{-\sigma^2/t^2}\right)^{\alpha}\right)^{\beta-1}}{t^3} \quad \text{for } t>0 \tag{4}$$

Where α, β, $\sigma>0$ are shape parameters. When $\alpha = \beta = 1$ the cdf of exponentiated inverse Rayleigh distribution (Eq. 3) becomes the cdf of ordinary inverse Rayleigh distribution as in Eq. 2.

MINIMUM SAMPLE SIZE

Researchers assume that the life time of a product follows an exponentiated inverse Rayleigh distribution defined by Eq. 4. One objective of this experiment is to set a lower confidence limit on the mean life time and reserchers want to test whether the mean life time of items is longer than the expectation. Assume that $\sigma = \sigma_0$ where σ_0 is the specified mean life time for items. The decision is to accept the lot if and only if the number of observed failures at the end of the fixed time (t) does not exceed a given acceptance number (c) or to terminate the test and reject the lot if there are more than c failures occurred before time (t) which implies that the true mean life time of items is below the specified one. The sampling plan contains the number of units n required on the test, an acceptance number (c) and a ratio t/σ_0. If c or fewer failures occur during the test time (t), the lot is accepted, otherwise the lot is rejected.

First, researchers fix the consumer risk, the probability of accepting a bad lot, not to exceed $1-p^*$. A bad lot means that the lot with true mean life time is below the specified mean life time σ_0. Thus, the probability (p^*) is a confidence level in the sense that the chance of rejecting a lot with $\sigma<\sigma_0$ is at least p^*. For a predetermined value of p^*, the sampling plan is characterized by the parameters (n, c, t/σ_0). Here, researchers consider a lot of infinitely large size so that the theory of binomial distribution can be applied.

According to the proposed sampling plan, researchers have to find the smallest positive integer 'n' which satisfies the inequality:

$$\sum_{i=0}^{c}\binom{n}{i}p^i(1-p)^{n-i}\le 1-p^* \tag{5}$$

Where, $p = F(t, \alpha, \beta, \sigma_0)$ is given by Eq. 3, the probability of failure observed during the time (t) when the true mean life time of items is σ_0. The smallest sample size satisfying the inequality Eq. 5 have been obtained for t/σ_0 = (1.0, 1.25, 1.5, 1.75, 2.0, 2.5, 3.0 and 3.5) and p^* = 0.75, 0.90, 0.95 and 0.99. These are given in Table 1 for $\alpha = 2$ and $\beta = 1$ and in Table 2 for $\alpha = 1$ and $\beta = 2$. These choices of p^* and t/σ_0 allow us to compare the results with those obtained by Rosaiah and Kantam (2005) for inverse Rayleigh distribution, i.e., when $\alpha = 1$ and $\beta = 1$ (Fig. 1).

Operating characteristic of the sampling plan (n, c, t/σ_0): The Operating Characteristic (OC) curve of the sampling plan (n, c, t/σ_0) gives the probability of accepting a lot and it is given by:

$$L(p)\sum_{i=0}^{c}\binom{n}{i}p^i(1-p)^{n-i} \tag{6}$$

Where, p is given by Eq. 4 is a monotonically decreasing function of $\sigma\ge\sigma_0$ for fixed t while L (p) is

Table 1: Minimum sample size necessary to assert the average life to exceed a given value μ_0 with probability (p^*) and the corresponding acceptance number (c) using binomial probabilities for exponentiated inverse Rayleigh distribution with $\alpha = 2$ and $\beta = 1$

		t/μ_0							
p^*	c	1.0	1.25	1.5	1.75	2.0	2.5	3.0	3.5
0.75	0	2	1	1	1	1	1	1	1
	1	4	3	2	2	2	2	2	2
	2	6	4	4	3	3	3	3	3
	3	8	6	5	5	4	4	4	4
	4	10	7	6	6	5	5	5	5
	5	11	9	7	7	7	6	6	6
	6	13	10	9	8	8	7	7	7
	7	15	11	10	9	9	8	8	8
	8	17	13	11	10	10	9	9	9
	9	19	14	12	11	11	10	10	10
	10	20	15	13	12	12	11	11	11
0.90	0	3	2	2	1	1	1	1	1
	1	5	4	3	3	2	2	2	2
	2	7	5	4	4	4	3	3	3
	3	9	7	6	5	5	4	4	4
	4	11	8	7	6	6	6	5	5
	5	13	10	8	7	7	7	6	6
	6	15	11	9	9	8	8	7	7
	7	17	13	11	10	9	9	8	8
	8	19	14	12	11	10	10	9	9
	9	21	15	13	12	11	11	11	10
	10	23	17	14	13	13	12	12	11
0.95	0	4	2	2	2	1	1	1	1
	1	6	4	3	3	3	2	2	2
	2	8	6	5	4	4	4	3	3
	3	11	7	6	6	5	5	4	4
	4	13	9	7	7	6	6	6	5
	5	15	11	9	8	7	7	7	6
	6	17	12	10	9	9	8	8	7
	7	19	13	11	10	10	9	9	8
	8	21	15	13	11	11	10	10	10
	9	23	16	14	13	12	11	11	11
	10	25	18	15	14	13	12	12	12
0.99	0	6	4	3	2	2	2	2	1
	1	8	6	4	4	3	3	3	3
	2	11	7	6	5	5	4	4	4
	3	13	9	7	6	6	5	5	5
	4	15	11	9	8	7	6	6	6
	5	18	12	10	9	8	7	7	7
	6	20	14	11	10	9	9	8	8
	7	22	15	13	11	11	10	9	9
	8	24	17	14	13	12	11	10	10
	9	26	18	15	14	13	12	11	11
	10	28	20	17	15	14	13	12	12

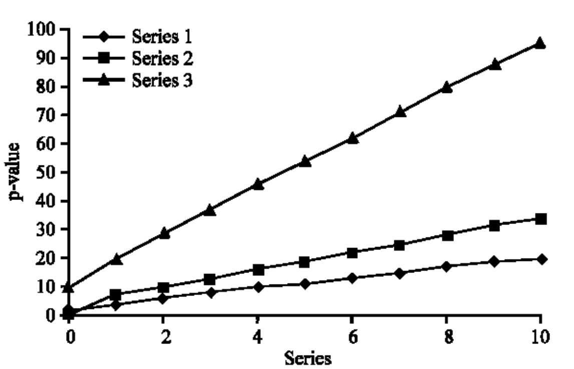

Fig. 1: Comparison of the value of n for $p^* = 0.75$, $\alpha = 2$ and $\beta = 1$ when (series 1); $\alpha = 1$ and $\beta = 1$ when (series 2, taken from Rosaiah and Kantam, 2005); $\alpha = 1$ and $\beta = 2$ (series 3)

Table 2: Minimum sample size necessary to assert the average life to exceed a given value μ_0 with probability (p^*) and the corresponding acceptance number (c) using binomial probabilities for exponentiated inverse Rayleigh distribution with $\alpha = 1$ and $\beta = 2$

		t/μ_0							
p^*	c	1.0	1.25	1.5	1.75	2.0	2.5	3.0	3.5
0.75	0	10	5	3	2	2	2	1	1
	1	20	9	6	5	4	3	3	3
	2	28	14	9	7	6	5	4	4
	3	37	18	12	9	8	6	6	6
	4	46	22	15	11	10	8	7	6
	5	54	26	17	13	11	9	8	8
	6	62	30	20	15	13	11	10	9
	7	71	34	23	18	15	12	11	10
	8	79	38	25	20	17	14	12	11
	9	87	42	28	22	18	15	14	13
	10	95	46	31	24	20	17	15	14
0.90	0	16	8	5	4	3	2	2	2
	1	28	13	8	6	5	4	4	3
	2	38	18	12	9	7	6	5	5
	3	48	23	15	11	9	7	6	6
	4	58	27	18	14	11	9	8	7
	5	67	32	21	16	13	11	9	9
	6	76	36	24	18	15	12	11	10
	7	85	40	27	20	17	14	12	11
	8	94	45	29	23	19	15	13	12
	9	103	49	32	25	21	17	15	14
	10	112	53	35	27	23	18	16	15
0.95	0	21	10	6	5	4	3	2	2
	1	34	16	10	8	6	5	4	4
	2	45	21	13	10	8	7	6	5
	3	55	26	17	13	11	8	7	6
	4	65	31	20	15	13	10	9	8
	5	75	35	23	18	15	12	10	9
	6	85	40	26	20	17	13	11	11
	7	94	45	29	22	19	15	13	12
	8	104	49	32	25	20	16	14	13
	9	113	53	35	27	22	18	16	14
	10	122	58	38	29	24	19	17	16
0.99	0	32	15	9	7	5	4	3	3
	1	47	21	14	10	8	6	5	5
	2	59	27	17	13	11	8	7	6
	3	71	33	21	16	13	10	9	8
	4	82	38	25	18	15	12	10	9
	5	93	43	28	21	17	14	12	11
	6	104	48	31	24	19	15	13	12
	7	114	53	34	26	22	17	15	13
	8	124	58	38	29	24	19	16	15
	9	134	63	41	31	26	20	18	16
	10	144	68	44	33	28	22	19	17

decreasing in p. Based on Eq. 6, the operating characteristic values for fixed value of c (say c = 2) are given in Table 3 for $\alpha = 2$ and $\beta = 1$ and in Table 4 for $\alpha = 2$ and $\beta = 2$. For given p^* and t/σ_0, the choice of c and n can be made on the basis of the OC function.

Producer's risk: The producer risk is the probability of rejecting a good lot. For a given value of the producer risk say 0.05, one may be interested in knowing what value of σ/σ_0 will ensure the producer risk ≤ 0.05, if a sampling plan $(n, c, t/\sigma_0)$ is adopted.

Table 3: Operating characteristic values of the sampling plan (n, c, t/σ_0) for given p^* under exponentiated inverse Rayleigh distribution with $\alpha = 2$ and $\beta = 1$

				σ/σ_0				
p^*	c	n	t/σ_0	2	4	6	8	10
0.75	2	6	1.00	0.9991	1	1	1	1
		4	1.25	0.9883	1	1	1	1
		4	1.50	0.9090	1	1	1	1
		3	1.75	0.8973	1	1	1	1
		3	2.00	0.7835	1	1	1	1
		3	2.50	0.5317	0.9967	1	1	1
		3	3.00	0.3387	0.9704	1	1	1
		3	3.50	0.2152	0.8973	0.9989	1	1
0.90	2	7	1.00	0.9985	1	1	1	1
		5	1.25	0.9740	1	1	1	1
		4	1.50	0.9090	1	1	1	1
		4	1.75	0.7334	1	1	1	1
		4	2.00	0.5241	0.9998	1	1	1
		3	2.50	0.5317	0.9967	1	1	1
		3	3.00	0.3387	0.9704	1	1	1
		3	3.50	0.2152	0.8973	0.9989	1	1
0.95	2	8	1.00	0.9977	1	1	1	1
		6	1.25	0.9538	1	1	1	1
		5	1.50	0.8242	1	1	1	1
		4	1.75	0.7334	1	1	1	1
		4	2.00	0.5241	0.9998	1	1	1
		4	2.50	0.2178	0.9883	1	1	1
		3	3.00	0.3387	0.9704	1	1	1
		3	3.50	0.2152	0.8973	0.9989	1	1
0.99	2	11	1.00	0.9937	1	1	1	1
		7	1.25	0.9279	1	1	1	1
		6	1.50	0.7266	1	1	1	1
		5	1.75	0.5592	1	1	1	1
		5	2.00	0.3167	0.9995	1	1	1
		4	2.50	0.2178	0.9883	1	1	1
		4	3.00	0.0832	0.9090	0.9998	1	1
		4	3.50	0.0325	0.7334	0.9960	1	1

The value of σ/σ_0 can be taken as the smallest number of σ/σ_0 so that p satisfies the inequality:

$$\sum_{i=0}^{c}\binom{n}{x}p^{x}(1-p)^{n-x} \geq 0.95 \tag{7}$$

For a given acceptance sampling plan at specified confidence value p^* and t/σ_0, the minimum value of satisfying Eq. 7 was determined and presented in Table 5 for $\alpha = 2$ and $\beta = 1$ and in Table 6 for $\alpha = 1$ and $\beta = 2$.

Description of tables: Assume that an experimenter wants to establish that the true unknown average life is at least 1000 h with confidence $p^* = 0.95$. It is desired to stop the experiment at t = 1000 h. Then for an acceptance number c = 2, $\alpha = 2$, $\beta = 1$, $p^* = 0.95$ and $t/\sigma_0 = 1.0$ from Table 1, the minimum sample size required is 8. Thus, n = 8 units have to be put on test. If during 1000 h, no >2 failures out of the 8 units are observed then the experimenter can assert with a confidence of $p^* = 0.95$ that the average life is at least 1000 h. For the same confidence level for $\alpha = 1$ and $\beta = 2$, the value of n is 45 from Table 2.

Table 4: Operating characteristic values of the sampling plan (n, c, t/σ_0) for given p^* under exponentiated inverse Rayleigh distribution with $\alpha = 1$ and $\beta = 2$

				σ/σ_0				
p^*	c	n	t/σ_0	2	4	6	8	10
0.75	2	28	1.00	1	1	1	1	1
		14	1.25	0.9999	1	1	1	1
		9	1.50	0.9983	1	1	1	1
		7	1.75	0.9890	1	1	1	1
		6	2.00	0.9639	1	1	1	1
		5	2.50	0.8647	1	1	1	1
		4	3.00	0.8078	0.9999	1	1	1
		4	3.50	0.6562	0.9985	1	1	1
0.90	2	38	1.00	1	1	1	1	1
		18	1.25	0.9998	1	1	1	1
		12	1.50	0.9958	1	1	1	1
		9	1.75	0.9763	1	1	1	1
		7	2.00	0.9432	1	1	1	1
		6	2.50	0.7839	1	1	1	1
		5	3.00	0.6632	0.9998	1	1	1
		5	3.50	0.4617	0.9965	1	1	1
0.95	2	45	1.00	1.0000	1	1	1	1
		21	1.25	0.9997	1	1	1	1
		13	1.50	0.9946	1	1	1	1
		10	1.75	0.9680	1	1	1	1
		8	2.00	0.9180	1	1	1	1
		7	2.50	0.6963	1	1	1	1
		6	3.00	0.5213	0.9996	1	1	1
		5	3.50	0.4617	0.9965	1	1	1
0.99	2	59	1.00	1.0000	1	1	1	1
		27	1.25	0.9994	1	1	1	1
		17	1.50	0.9883	1	1	1	1
		13	1.75	0.9352	1	1	1	1
		11	2.00	0.8219	1	1	1	1
		8	2.50	0.6077	1	1	1	1
		7	3.00	0.3959	0.9993	1	1	1
		6	3.50	0.3062	0.9993	1	1	1

For the sampling plan n = 8, c = 2, $\beta = 1$, $p^* = 0.95$ and $t/\sigma_0 = 1.0$, the operating characteristic values from Table 3 are:

σ/σ_0	2	4	6	8	10
L(p)	0.9977	1	1	1	1

This shows that if the true mean life is twice the specified mean life, the producer's risk is approximately 0.0023. From Table 5, researchers can get the value of σ/σ_0 for various choices of c, t/σ_0 in order that the producer risk may not exceed 0.05. Thus in the earliar example, earliar obtain the value 1.42 for $\alpha = 2$ and $\beta = 1$. That is, the product should have an average life of 1.42 times the specified average life 1000 h in order that under the earliar acceptance sampling plan n = 8 and c = 2, the product is accepted with probability of at least 0.95. The actual average life necessary for producer risk of 0.95 is tablulated in Table 5 for $\alpha = 2$ and $\beta = 1$ and in Table 6 for $\alpha = 1$ and $\beta = 2$.

Table 5: Minimum ratio of true life to specified mean life for the acceptance of a lot with producer's risk of 0.05 (when $\alpha = 2$ and $\beta = 1$)

		σ/σ_0							
p^*	c	1.0	1.25	1.5	1.75	2.0	2.5	3.0	3.5
0.75	0	1.63	1.90	2.15	2.38	2.72	3.39	3.68	4.29
	1	1.42	1.58	1.77	1.99	2.16	2.50	3.00	3.50
	2	1.33	1.48	1.62	1.78	1.94	2.29	2.51	2.92
	3	1.28	1.41	1.54	1.66	1.82	2.02	2.43	2.83
	4	1.26	1.36	1.49	1.58	1.74	1.97	2.20	2.32
	5	1.23	1.33	1.43	1.52	1.62	1.83	2.03	2.37
	6	1.21	1.30	1.40	1.48	1.58	1.82	2.05	2.22
	7	1.20	1.28	1.38	1.47	1.56	1.72	1.94	2.09
	8	1.19	1.27	1.35	1.44	1.53	1.72	1.84	1.99
	9	1.18	1.26	1.33	1.42	1.47	1.65	1.87	2.05
	10	1.17	1.24	1.32	1.40	1.46	1.65	1.80	1.96
0.90	0	1.70	1.99	2.28	2.59	2.86	3.39	4.07	4.75
	1	1.48	1.68	1.86	2.06	2.27	2.70	3.24	3.50
	2	1.39	1.55	1.73	1.89	2.03	2.43	2.74	3.20
	3	1.34	1.48	1.63	1.76	1.89	2.16	2.43	2.83
	4	1.30	1.42	1.56	1.70	1.80	2.08	2.37	2.57
	5	1.28	1.39	1.51	1.63	1.73	2.02	2.19	2.56
	6	1.25	1.36	1.48	1.58	1.69	1.90	2.18	2.40
	7	1.24	1.34	1.45	1.53	1.65	1.88	2.06	2.26
	8	1.26	1.32	1.41	1.52	1.61	1.79	1.96	2.15
	9	1.21	1.30	1.39	1.49	1.59	1.78	1.97	2.19
	10	1.21	1.29	1.38	1.47	1.57	1.72	1.90	2.10
0.95	0	1.74	2.04	2.32	2.65	2.96	3.57	4.07	4.75
	1	1.51	1.72	1.93	2.17	2.36	2.84	3.24	3.78
	2	1.42	1.59	1.75	1.94	2.10	2.54	2.91	3.20
	3	1.36	1.51	1.67	1.83	2.01	2.27	2.59	2.83
	4	1.32	1.46	1.60	1.73	1.90	2.17	2.50	2.76
	5	1.30	1.42	1.55	1.69	1.82	2.10	2.32	2.56
	6	1.28	1.39	1.51	1.63	1.77	1.98	2.18	2.54
	7	1.26	1.37	1.48	1.59	1.72	1.94	2.16	2.40
	8	1.25	1.35	1.45	1.57	1.65	1.86	2.06	2.29
	9	1.23	1.33	1.43	1.54	1.62	1.84	2.06	2.19
	10	1.22	1.32	1.41	1.51	1.60	1.77	1.98	2.21
0.99	0	1.80	2.11	2.42	2.75	3.03	3.70	4.29	5.00
	1	1.58	1.79	2.03	2.25	2.48	2.95	3.41	3.97
	2	1.47	1.65	1.84	2.04	2.26	2.63	3.04	3.40
	3	1.41	1.58	1.74	1.92	2.09	2.44	2.83	3.18
	4	1.37	1.52	1.68	1.82	1.98	2.32	2.61	2.91
	5	1.34	1.48	1.62	1.76	1.90	2.23	2.52	2.83
	6	1.32	1.44	1.58	1.72	1.83	2.11	2.37	2.66
	7	1.30	1.42	1.54	1.67	1.81	2.06	2.33	2.52
	8	1.28	1.40	1.52	1.65	1.77	2.02	2.23	2.51
	9	1.27	1.38	1.50	1.61	1.73	1.94	2.21	2.40
	10	1.26	1.37	1.47	1.58	1.70	1.91	2.13	2.31

Table 6: Minimum ratio of true life to specified mean life for the acceptance of a lot with producer's risk of 0.05 $\alpha = 1$ and $\beta = 2$

		σ/σ_0							
p^*	c	1.0	1.25	1.5	1.75	2.0	2.5	3.0	3.5
0.75	0	2.09	2.40	2.88	3.36	3.84	4.80	5.76	6.72
	1	1.74	2.04	2.19	2.56	2.92	3.65	4.38	5.11
	2	1.60	1.78	2.13	2.21	2.52	3.15	3.78	4.41
	3	1.52	1.74	1.94	2.26	2.28	2.85	3.42	3.99
	4	1.47	1.62	1.80	2.10	2.11	2.64	3.17	3.70
	5	1.39	1.61	1.70	1.98	2.27	2.49	2.98	3.48
	6	1.37	1.54	1.75	1.89	2.16	2.37	2.84	3.31
	7	1.35	1.48	1.68	1.81	2.07	2.27	2.72	3.17
	8	1.34	1.49	1.62	1.74	1.99	2.18	2.62	3.06
	9	1.32	1.45	1.57	1.69	1.93	2.11	2.53	2.96
	10	1.29	1.40	1.52	1.64	1.87	2.05	2.46	2.87

Table 6: Continue

		σ/σ_0							
p^*	c	1.0	1.25	1.5	1.75	2.0	2.5	3.0	3.5
0.90	0	2.19	2.62	3.14	3.36	3.84	4.8	5.76	6.72
	1	1.81	2.17	2.45	2.56	2.92	3.65	4.38	5.11
	2	1.65	1.90	2.13	2.49	2.84	3.15	3.78	4.41
	3	1.56	1.83	2.08	2.26	2.59	2.85	3.42	3.99
	4	1.51	1.71	1.94	2.10	2.40	3.00	3.17	3.70
	5	1.46	1.68	1.84	1.98	2.27	2.83	2.98	3.48
	6	1.43	1.61	1.75	2.04	2.16	2.70	2.84	3.31
	7	1.41	1.60	1.77	1.96	2.07	2.58	2.72	3.17
	8	1.39	1.54	1.71	1.89	1.99	2.49	2.62	3.06
	9	1.37	1.50	1.66	1.83	1.93	2.41	2.89	2.96
	10	1.36	1.50	1.61	1.77	2.03	2.34	2.81	2.87
0.95	0	2.25	2.62	3.14	3.66	3.84	4.80	5.76	6.72
	1	1.86	2.17	2.45	2.56	3.27	3.65	4.38	5.11
	2	1.70	1.99	2.28	2.49	2.84	3.55	3.78	4.41
	3	1.64	1.83	2.08	2.43	2.59	3.23	3.42	3.99
	4	1.57	1.77	1.94	2.27	2.40	3.00	3.60	3.70
	5	1.52	1.74	1.94	2.14	2.27	2.83	3.40	3.48
	6	1.48	1.66	1.85	2.04	2.33	2.70	3.23	3.31
	7	1.45	1.60	1.77	1.96	2.24	2.58	3.10	3.17
	8	1.43	1.59	1.79	1.89	2.16	2.49	2.99	3.48
	9	1.41	1.54	1.73	1.93	2.09	2.41	2.89	3.37
	10	1.39	1.54	1.68	1.88	2.03	2.34	2.81	3.27
0.90	0	2.34	2.81	3.28	3.66	4.18	5.23	6.27	6.72
	1	1.94	2.32	2.60	3.03	3.27	4.08	4.90	5.71
	2	1.80	2.06	2.39	2.66	3.04	3.55	4.26	4.97
	3	1.69	1.95	2.19	2.43	2.78	3.23	3.88	4.52
	4	1.62	1.88	2.13	2.39	2.59	3.00	3.60	4.20
	5	1.59	1.79	2.02	2.26	2.45	2.83	3.40	3.96
	6	1.55	1.75	1.93	2.15	2.33	2.91	3.23	3.77
	7	1.51	1.69	1.92	2.07	2.36	2.79	3.10	3.62
	8	1.48	1.67	1.85	2.09	2.28	2.69	2.99	3.48
	9	1.46	1.62	1.80	2.02	2.21	2.61	2.89	3.37
	10	1.44	1.61	1.80	1.96	2.15	2.53	2.81	3.27

COMPARISON OF EXPONENTIATED INVERSE RAYLEIGH DISTRIBUTION WITH INVERSE RAYLEIGH DISTRIBUTION

The exponentiated inverse Rayleigh distribution becomes the ordinary inverse Rayleigh distribution when $\alpha = \beta = 1$. Hence, the results obtained by Rosaiah and Kantam (2005) for inverse Rayleigh distribution are compared with results obtained here for different combinations of α and β.

From Table 1 and 2, it is found that the value of n increases rapidly when the shape parameter β increases and the value of n decrease when the shape parameter α increases.

CONCLUSION

In this study, minimum sample size required for acceptance sampling plan from truncated life tests based on exponentiated inverse Rayleigh distribution was proposed for different combinations of the shape parameter α and β. It is found that when the shape parameter β increases, the value of n increases rapidly and when the value of the shape parameter α increases, the value of n decreases. Probability of acceptance for various ratio of unknown average life time to the specified life time for exponentiated inverse Rayleigh distribution was tabulated when the consumer's risk are specified.

REFERENCES

Baklizi, A. and A. El-Masri, 2004. Acceptance sampling based on truncated life tests in the Birnbaum Saunders model. Risk Anal., 24: 1453-1457.

Balakrishnan, N., V. Leiva and J. Lopez, 2007. Acceptance sampling plans from truncated life tests based on the generalized Birnbaum-Saunders distribution. Commun. Stat. Simul. Comput., 36: 643-656.

Cordeiro, G.M., E.M. Ortega and D.C.C. da Cunha, 2013. The exponentiated Generalized class of distribution. J. Data Sci., 11: 1-27.

Epstein, B., 1954. Truncated life test in the exponential case. Ann. Math. Stat., 25: 555-564.

Goode, H.P. and J.H.K. Kao, 1961. Sampling plans based on the Weibull distribution. Proceedings of the 7th National Symposium on Reliability and Quality Control, January 9-11, 1961, Philadelphia, pp: 24-40.

Gupta, S.S. and P.A. Groll, 1961. Gamma distribution in acceptance sampling based on life tests. J. Am. Stat. Assoc., 56: 942-970.

Lio, Y.L., T.R. Tsai and S.J. Wu, 2010. Acceptance sampling plans from truncated life tests based on the Burr type XII percentiles. J. Chin. Inst. Ind. Eng., 27: 270-280.

Rosaiah, K. and R.R.L. Kantam, 2005. Acceptance sampling based on the inverse Rayleigh distribution. Econ. Quality Control, 20: 277-286.

Sobel, M. and J.A. Tischendrof, 1959. Acceptance sampling with new life test objectives. Proceedings of 5th National Symposium on Reliability and Quality Control, (NSRQC`59), Philadelphia, Pennsylvania, pp: 108-118.

Srinivasa Rao, G., M.E. Ghitany and R.R.L. Kantam, 2011. An economic reliability test plan for Marshall olkin extended exponential distribution. Applied Math. Sci., 5: 103-112.

Tsai, T.R. and C.J. Wu, 2008. Reliability sampling plans under truncated life tests with inverse Gaussian data. Biomedical Soft Comput. Human Sci., 13: 13-24.