**MODERN COLLEGE OF ARTS,SCI. & COMM. PUNE-05.**

**DEPARTMENT OF STATISTICS. ( Autonomous)**

M.Sc.( I )- ST-15

**EXPT.NO. 8(A) Date:**

Sub. Date

:

**TITLE : Model sampling from Discrete, continuous and mixture distributions.**

1. **.** Suppose that the discrete random variables X has probability function.

Generate a random sample of size 30 and obtain the mean

1. The lead time for orders of diodes from a certain manufacturer is known to have a gamma distribution with a mean of 20 day and a standard deviation of 10 days. Generate a 50 realization and compute the probability of receiving an order within 15 days of the placement date.
2. The time to failure of a certain transistor is known as Weibull distribution with parameter 𝛾 = 0, 𝛽 = 1/3 and 𝛿=400. Obtain the realization of 50 observation and find the expected failureof transistor.
3. Generate a random sample of size 20 from 𝜒216 and compute median.
4. The random variable Y=ln X has a N(50,25) distribution. Generate a random sample of size 35 from the distribution given above. Find mean and variance from the generalization.

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**Solution**

**ALGORITHM**

Que1.

1. Generate random sample from U(0, 1)
2. If a random number is less than 0.35 then take x as -2.5
3. If a random number is lies between 0.35-0.60 then take x as 1
4. If random number is lies between 0.60-1 then take x as 10.5
5. Repeat this procedure ‘n’ times

Que.2.

Algorithm :

1. Generate random sample from U(0, 1)
2. Obtain random sample from given gamma distribution using following transformation

Yi =

1. Repeat this procedure ‘n’ times .

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Repeat this procedure ‘n’ times

Que.3.

X Weibull (𝛾 = 0 , 𝛽 = 1/3 , 𝛿 = 400)

p.d.f. of Weibull distribution

The distribution function of Weibull distribution

F(x) =

Mean = E(x) =

Variance = Var(x) =

F(x) = r

1 - = r

1 – r =

=

=

=

Algorithm :

1. Generate random sample from U(0, 1)
2. Generate random sample from Weibull distribution using following transformation
3. Repeat the procedure n times.

Que.4.

1. Generate a random sample from given chi-quare distribution using command

rchisq(20,16)

Que.5.

Y = ln(x) N(50,25)

n = 35

If Y is normally distributed then x is said to have lognormal distribution

p.d.f. of x is given by ,

= 0 ; o.w.

μ = 50 , σ = 5

Generating log normally distributed random variables

Given a random variable z drawn from N(0, 1) Then,

x = eμ+σzhas a lognormal distribution with parameters μ and σ2

x LN(μ,σ2)

ln x N(μ,σ2)

ln x = μ + σz

x = eμ + σz

Algorithm :

1. Generate random sample of size n from N(0, 1)
2. Obtain random sample from given lognormal distribution using following transformation
3. Repeat procedure n times.

**Q.1**

> n=30

> r=runif(30,0,1)

> r

[1] 0.72984072 0.21939315 0.66441730 0.23085257 0.67717062 0.19074122 0.01107037 0.95081776 0.75974963 0.72947088 0.49862100 0.16139599 0.65053959 0.46733349 0.75944812 0.29380586

[17] 0.43116418 0.49973795 0.40015248 0.29336862 0.59631150 0.88313692 0.25764252 0.73467201 0.81684257 0.13430261 0.40637895 0.20148708 0.76351700 0.32369484

> x=rep(0,30)

> for(i in 1:n)

+ {

+ if(r[i]<=0.35) {x[i]=-0.25}

+ else if((r[i]>0.35&r[i]<=0.60))

+ {x[i]=1}

+ if(r[i]>0.60&r[i]<=1)

+ {x[i]=10.5}

+ }

> x

[1] 10.50 -0.25 10.50 -0.25 10.50 -0.25 -0.25 10.50 10.50 10.50 1.00 -0.25 10.50 1.00 10.50 -0.25 1.00 1.00 1.00 -0.25 1.00 10.50 -0.25 10.50 10.50 -0.25 1.00 -0.25 10.50 -0.25

> mean(x)

[1] 4.341667

**Q.2**

> n=50

> alpha=0.2

> y=rep(0,50)

> for(i in 1:50)

+ {

+ r=runif(4,0,1)

+ y[i]=round((-1/alpha)\*log(prod(1-r)))

+ }

> y

[1] 26 16 13 16 26 18 21 26 49 8 25 9 28 14 25 17 10 13 8 17 17 12 6 7 18 7 33 45 21 20 25 22 22 16 54 10 20 22 6 7 19 14 44 25 20 26 39 12 7 20

> y15=length(x[x<=15])

> y15

[1] 30

> prob=y15/50

> prob

[1] 0.6

**Q.3**

> gamma=0; beta=1/3; delta=400

> x=rep(0,50)

> r=runif(50,0,1)

> r

[1] 0.72930500 0.30571631 0.54217166 0.64157644 0.46769038 0.23361443 0.08771375 0.91961460 0.13611986 0.92305884 0.83381010 0.45855752 0.48918768 0.07306226 0.45061642 0.90473555

[17] 0.08963848 0.15591060 0.39574853 0.69453843 0.82311200 0.42526305 0.21412907 0.83616296 0.12501570 0.23568334 0.60776703 0.64930217 0.10248291 0.81469374 0.01884655 0.57830144

[33] 0.35754287 0.05349554 0.93451173 0.99575428 0.63777112 0.91422874 0.31089850 0.87706210 0.52107143 0.84448738 0.45947128 0.22992501 0.61581846 0.79143512 0.66598865 0.40459243

[49] 0.56533097 0.49117123

> for(i in 1:50)

+ {

+ x[i]=gamma+(delta\*(-log(1-r[i]))^(1/beta))

+ }

> x

[1] 8.925860e+02 1.943081e+01 1.907429e+02 4.320686e+02 1.002714e+02 7.534374e+00 3.094631e-01 6.408237e+03 1.253090e+00 6.748029e+03 2.311961e+03 9.237253e+01 1.212520e+02 1.746832e-01

[15] 8.595081e+01 5.198433e+03 3.313171e-01 1.947803e+00 5.113797e+01 6.671732e+02 2.079137e+03 6.795471e+01 5.596410e+00 2.367508e+03 9.527637e-01 7.766358e+00 3.279045e+02 4.601854e+02

[29] 5.056100e-01 1.916178e+03 2.755059e-03 2.575096e+02 3.464718e+01 6.647596e-02 8.101813e+03 6.517448e+04 4.188638e+02 5.926290e+03 2.065249e+01 3.683672e+03 1.596078e+02 2.578214e+03

[43] 9.313756e+01 7.133712e+00 3.501916e+02 1.540589e+03 5.274500e+02 5.576082e+01 2.313457e+02 1.233710e+02

**Q.4**

c=rchisq(20,16)

> c

[1] 14.405408 10.812528 17.118379 20.811384 17.535572 18.893095 19.697390 15.500576 7.160588 8.086562 15.126299 8.685515 13.861999 18.309114 13.578923 16.314146 13.777224 18.471807

[19] 27.004619 15.159874

**Q.5**

> n=35

> mu=50; var=25

> x=rep(0,35)

> for(i in 1:35)

+ {

+ z=rnorm(1,0,1)

+ x[i]=exp(mu+z\*sqrt(var))

+ }

> x

[1] 9.536677e+20 4.757745e+23 1.863215e+19 2.354275e+20 3.689000e+20 9.484541e+18 4.720073e+20 3.428039e+23 1.168960e+21 6.387842e+20 2.016543e+23 4.259184e+21 1.139316e+19 2.216481e+21

[15] 4.753081e+18 3.848513e+21 8.847997e+16 1.809659e+26 1.950057e+15 2.688554e+22 8.865737e+26 3.004933e+19 6.299403e+19 1.802936e+20 2.958564e+24 2.847497e+19 2.748384e+18 8.251037e+20

[29] 6.792102e+17 2.298563e+18 1.244595e+24 6.515962e+18 2.556490e+23 1.659069e+25 1.444483e+22

> mean(x)

[1] 3.113332e+25

> var(x)

[1] 2.309184e+52

> var=var(x)\*((n-1)/n)

> var

[1] 2.243208e+52