OR 441: Simulation and Modeling
Tutorial Handout #6 : Spreadsheet Simultion

Question 1:

Question 2:

Write a one line spreadsheet formula to generate Bernoulli random variables with success probability, 0.35

=IF(RAND()<0.35,1,0)

Question 3:

Write a one line spreadsheet formula to generate random variables from a Normal distribution with mean 10.0 and variance 4.0

=NORM.INV(RAND(),10,2)

Question 4:

Write a one line spreadsheet formula to generate random variables from an exponential distribution with a rate parameter of 5 per hour.

=-1*(1/5)*LN(1-RAND())

Question 5:

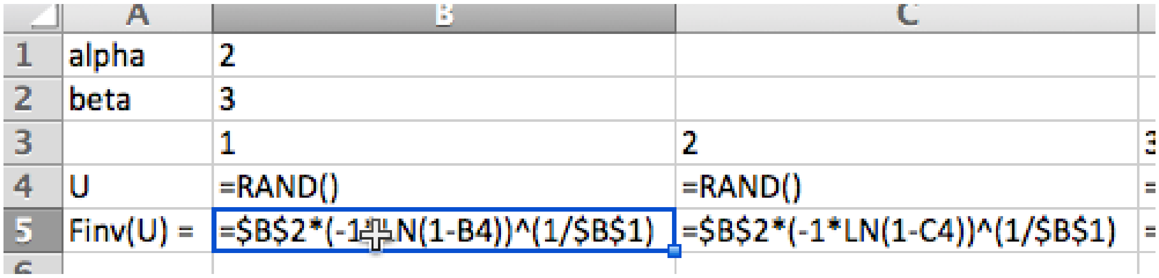
The service times for an automated storage and retrieval system has a shifted exponential distribution. It is known that it takes a minimum of 15 seconds for any retrieval. The parameter of the exponential distribution is λ = 45. Setup a spreadsheet that will generate 20 observations of the service times.

=15 + (-1*(1/45)*LN(1-RAND()))

Question 6:

The time to failure for a computer printer fan has a Weibull distribution with shape parameter α = 2 and scale parameter β= 3. Setup a spreadsheet that will generate 10 failure times for the computer printer fan.

=3*(-1*LN(1-RAND()))^(1/2)

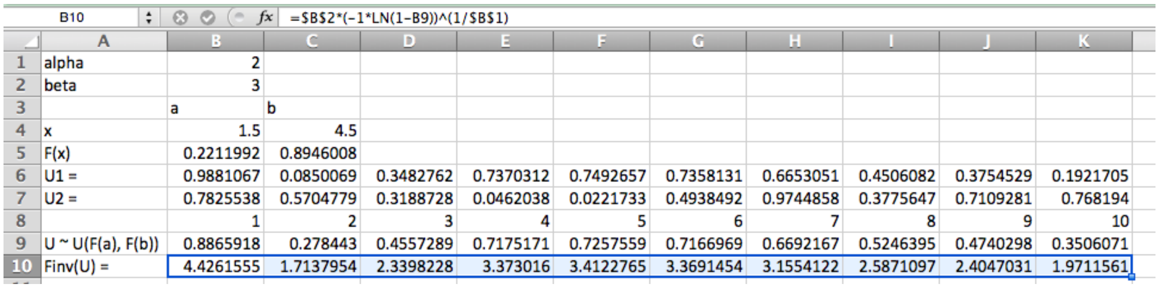


	A	B	C	
1	alpha	2		
2	beta	3		
3		1	2	3
4	U	=RAND()	=RAND()	=
5	Finv(U) =	=$B$2*(-1*LN(1-B4))^(1/$B$1)	=$B$2*(-1*LN(1-C4))^(1/$B$1)	=

Question 7:

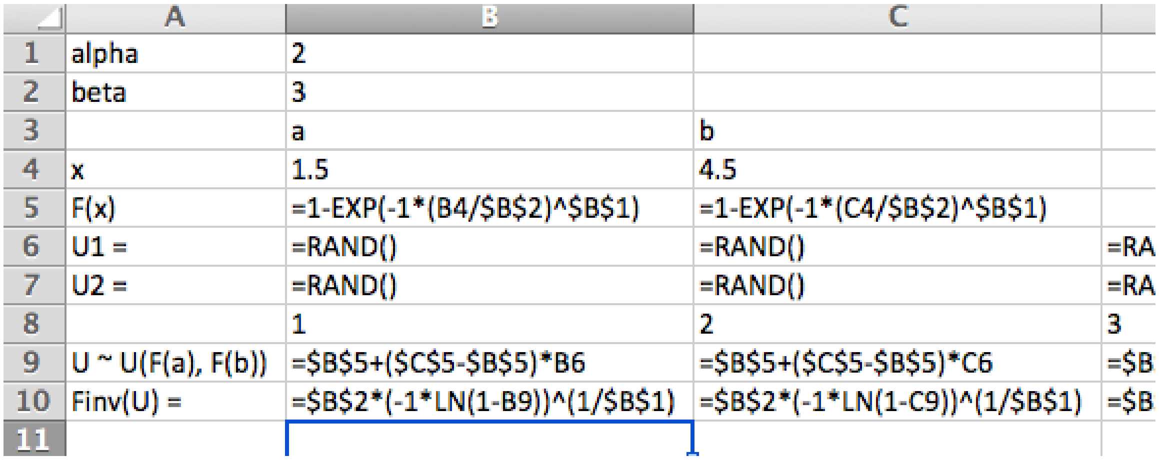
The time to failure for a computer printer fan has a Weibull distribution with shape parameter α = 2 and scale parameter β= 3. Testing has indicated that the distribution is limited to the range from 1.5 to 4.5.

Set up a spreadsheet to generate 100 observations from this truncated distribution.



B10 =$B$2*(-1*LN(1-B9))^(1/$B$1)

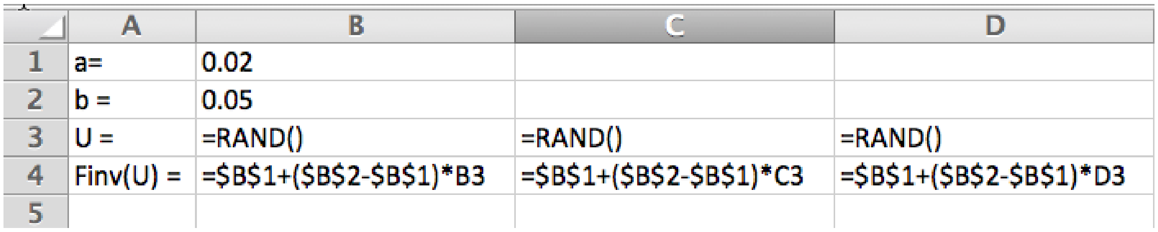
	A	B	C	D	E	F	G	H	I	J	K
1	alpha	2									
2	beta	3									
3		a	b								
4	x	1.5	4.5								
5	F(x)	0.2211992	0.8946008								
6	U1 =	0.9881067	0.0850069	0.3482762	0.7370312	0.7492657	0.7358131	0.6653051	0.4506082	0.3754529	0.1921705
7	U2 =	0.7825538	0.5704779	0.3188728	0.0462038	0.0221733	0.4938492	0.9744858	0.3775647	0.7109281	0.768194
8		1	2	3	4	5	6	7	8	9	10
9	U ~ U(F(a), F(b))	0.8865918	0.278443	0.4557289	0.7175171	0.7257559	0.7166969	0.6692167	0.5246395	0.4740298	0.3506071
10	Finv(U) =	4.4261555	1.7137954	2.3398228	3.373016	3.4122765	3.3691454	3.1554122	2.5871097	2.4047031	1.9711561



	A	B	C	
1	alpha	2		
2	beta	3		
3		a	b	
4	x	1.5	4.5	
5	F(x)	=1-EXP(-1*(B4/$B$2)^$B$1)	=1-EXP(-1*(C4/$B$2)^$B$1)	
6	U1 =	=RAND()	=RAND()	=RA
7	U2 =	=RAND()	=RAND()	=RA
8		1	2	3
9	U ~ U(F(a), F(b))	=$B$5+($C$5-$B$5)*B6	=$B$5+($C$5-$B$5)*C6	=$B
10	Finv(U) =	=$B$2*(-1*LN(1-B9))^(1/$B$1)	=$B$2*(-1*LN(1-C9))^(1/$B$1)	=$B
11				

Question 8:

The interest rate for a capital project is unknown. An accountant has estimated that the minimum interest rate will between 2% and 5% within the next year. The accountant believes that any interest rate in this range is equally likely. You are tasked with generating interest rates for a cash flow analysis of the project. Setup a spreadsheet that will generate 5 interest rate values for the capital project analysis.

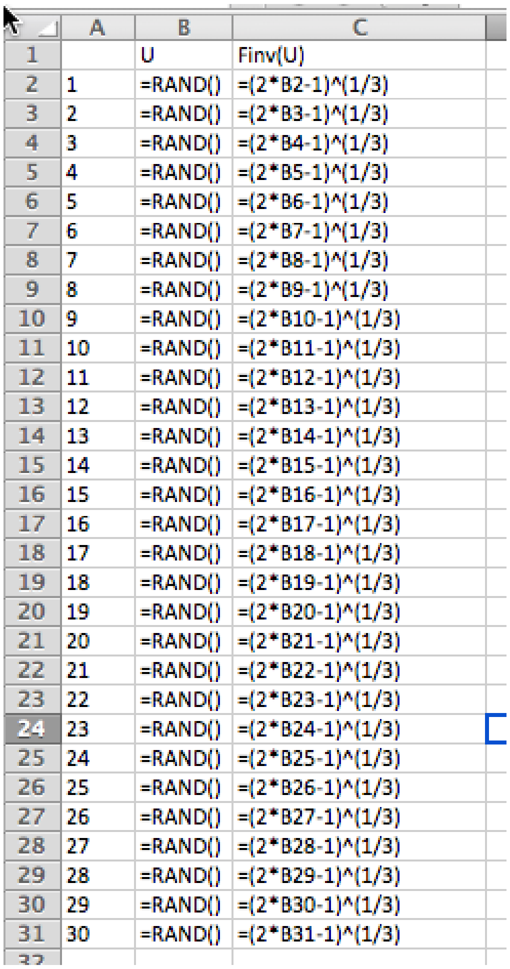


	A	B	C	D
1	a=	0.02		
2	b =	0.05		
3	U =	=RAND()	=RAND()	=RAND()
4	Finv(U) =	=$B$1+($B$2-$B$1)*B3	=$B$1+($B$2-$B$1)*C3	=$B$1+($B$2-$B$1)*D3
5				

Question 9:

Setup a spreadsheet to generate 30 observations from the following probability density function:

$$f(x) = \begin{cases} \frac{3x^2}{2} & -1 \le x \le 1 \\ 0 & \text{otherwise} \end{cases}$$



	A	B	C
1		U	Finv(U)
2	1	=RAND()	=(2*B2-1)^(1/3)
3	2	=RAND()	=(2*B3-1)^(1/3)
4	3	=RAND()	=(2*B4-1)^(1/3)
5	4	=RAND()	=(2*B5-1)^(1/3)
6	5	=RAND()	=(2*B6-1)^(1/3)
7	6	=RAND()	=(2*B7-1)^(1/3)
8	7	=RAND()	=(2*B8-1)^(1/3)
9	8	=RAND()	=(2*B9-1)^(1/3)
10	9	=RAND()	=(2*B10-1)^(1/3)
11	10	=RAND()	=(2*B11-1)^(1/3)
12	11	=RAND()	=(2*B12-1)^(1/3)
13	12	=RAND()	=(2*B13-1)^(1/3)
14	13	=RAND()	=(2*B14-1)^(1/3)
15	14	=RAND()	=(2*B15-1)^(1/3)
16	15	=RAND()	=(2*B16-1)^(1/3)
17	16	=RAND()	=(2*B17-1)^(1/3)
18	17	=RAND()	=(2*B18-1)^(1/3)
19	18	=RAND()	=(2*B19-1)^(1/3)
20	19	=RAND()	=(2*B20-1)^(1/3)
21	20	=RAND()	=(2*B21-1)^(1/3)
22	21	=RAND()	=(2*B22-1)^(1/3)
23	22	=RAND()	=(2*B23-1)^(1/3)
24	23	=RAND()	=(2*B24-1)^(1/3)
25	24	=RAND()	=(2*B25-1)^(1/3)
26	25	=RAND()	=(2*B26-1)^(1/3)
27	26	=RAND()	=(2*B27-1)^(1/3)
28	27	=RAND()	=(2*B28-1)^(1/3)
29	28	=RAND()	=(2*B29-1)^(1/3)
30	29	=RAND()	=(2*B30-1)^(1/3)
31	30	=RAND()	=(2*B31-1)^(1/3)