Simulation Exam Name: **University of the Ryukyus**
3-rd year undergraduate No: **Faculty of Engineering**
2012-2-10 Last Term Examination **Department of Information Eng.**
Time: 90 minutes (write answers in boxes) **Prof. M.R. Asharif**

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1- *In the mixed congruential generator:*

$$x_{n+1} = 1001x_n + 111, (\mathrm{mod}\,100)$$

Simulate the first five numbers with seed $x_0 = 11$ **.**

x(0)=1, x(1)= ,x(2)= ,x(3)= ,x(4)= , x(5)=

10%

(Hint: See page 58-61)

2- *Derive the probability density function (pdf, f(x)) of the random variable X where:*

X= $-\log_e U$ ***with U(0,1)*** *10%*

(Hint: See page 33-34)

f(x)=

3- ***Simulate the normal distributed random variables (N1, N2) by using The Box-Muller method from the following U1, U2 uniform distributed random variables: U1=0.4, U2=0.5***

(N1= ,N2=

10%

(Hint: See page 78 Eq. 4.1)

4- *In Poisson distribution, if* λ ***=5, find: Pr[x=5]=? , E[x]=? and Var[x]=?***

Pr[x=5]= E[x]= Var[x]=

(Hint: See page 18, Chp. 2.7) *10%*

5- *In Randomised Response Technique (RRT), if we have:*

Pr[Yes|N]=0.8 (answering probability to non-embarrassing question).
Pr[Yes]=0.8 (total probability from survey).
p_0 ***=0.6 (probability for answering to non-embarrassing question).***
Find Pr[Yes|E]=? (answering probability to embarrassing question).

(Hint: See page 51) *10%*

Pr[Yes|E]=

6- ***Simulate a Binomial random variable X with B(7,0.4) from a set of uniform random variables U (0,1), by using Bernouli random variable, where:***
U1=0.8, U2=0.5, U3=0.3, U4=0.7, U5=0.1, U6=0.9, U7=0.2 *10%*

(Hint: See page 82)

X=

0 p=0.4 1

7- ***Simulate a Poisson distribution random variable, K, with parameter λ=0.5 from the following uniform random variables:***
U1=0.8, U2=0.9, U3= 0.5, U4= 0.2

(Hint: See page 84) *10%*

K=

8- ***Simulate the random variable X with the following probabilities:***

(Hint: see page 93) *10%*

I	0	1	2	3	4	5	6
Pr [X<I]	0.22	0.32	0.52	0.76	0.88	0.96	0.99

From a U(0,1) in the following table:

U	0.87	0.44	0.95	0.25	0.97	0.65	0.75
X							

9- ***Simulate random variable X with geometric distribution and p=0.3from U(0,1)=0.34***

(Hint: See page 93 Eq. 5.4) X= *10%*

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