

Simulation Exam. Name:
 3-rd year undergraduate No:
 2009-2-9 Last Term Examination
 Eng.

University of the Ryukyus
 Faculty of Engineering
 Department of Information

Time: 90 minutes (write answers in boxes) Prof. M.R. Asharif

1-In the mixed congruential generator:

$$x_{n+1} = 101x_n + 11(\text{mod } 100)$$

Simulate the first five numbers with seed $x_0 = 1$. Can you estimate a rule for $x(8)$?

(Hint:

See page 58-61) 10%

$x(0)=1,$ $x(1)=$ $,x(2)=$ $,x(3)=$ $,x(4)=$ $,x(5)=$ $x(8)=$

2- In randomised response technique (RRT), if we have:

$\Pr[\text{Yes}|\text{N}]=0.1$ (answering probability to non-embarrassing question).

$\Pr[\text{Yes}|\text{E}]=0.9$ (answering probability to embarrassing question).

$p_0=0.2$ (probability for answering to non-embarrassing question).

Find $\Pr[\text{Yes}]=?$ (total probability from survey).

(Hint: See page 51)

10%

$\Pr[\text{Yes}]=?$

3- In the following chaotic system:

$$x(n+1)=4 r x(n) [1-x(n)]$$

If the attractor of this chaotic system will be $x(\infty)=0.6$, find “r” by simulation or direct computation [for any value of $x(0)$]. 10%

(Hint: See chap

$r=?$

4- Find the probability of $S=k$, if we have the following relation:

$$S=X+Y$$

Where both random variables X and Y have the Geometric distribution:

$$\Pr[X=i]=q^{i-1} p \text{ and } \Pr[Y=i]=q^{i-1} p \quad (\text{see page 16})$$

(Hint: See page 38)

10%

$\Pr[S=K]=$

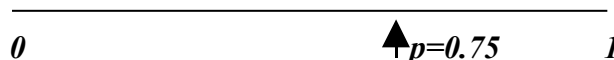
5- Simulate a Binomial random variable X with $B(7,0.75)$ from a set of uniform random variables $U(0,1)$, by using Bernouli random variable, where:

$U1=0.6068, U2=0.4860, U3=0.8913, U4=0.7621, U5=0.4565,$

$U6=0.0185, U7=0.8214$

(Hint: See page 82)

10%



$X=?$

6- Use the table-look-up method to simulate random variables X from $U(0,1)$.
 Where the p.d.f of X has logistic distribution (see page 28) as follows:

$$f(x) = e^{-x} / (1 + e^{-x})^2, \quad -\infty < x < \infty$$

10%

Also, find the value of X when $U=0.5$

(Hint: see page 95-96)

$X =$ $X u=0.5 =$

7- Simulate the normal distributed random variables ($N1, N2$) by using Box-Muller method from the following pair of uniform distributed random variables: $(U1, U2) = (0.606, 0.25)$ (Hint: See page 78 use Eq. 4.1)

10%

$(N1, N2) =$

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

(Hint: see page 93-94)

10%

I	0	1	2	3	4	5	6
Pr [X<I]	0.2311	0.4860	0.6068	0.8913	0.9218	0.9568	0.9797

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

U	0.2523	0.8757	0.7373	0.1365	0.2987	0.8939	0.4692
X							

9- Simulate random variable X with geometric distribution and $p=0.1$ from $U(0,1)=0.5$

(Hint: See page 93 Eq. 5.4)

10%

$X =$
