Simulation Exam **Name:** **University of the Ryukyus**
3-rd year undergraduate **No:** **Faculty of Engineering**
2007-2-5 Last Term Examination **Department of Information Eng.**
Time: 90 minutes (write answers in boxes) **Prof. M.R. Asharif**
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1- **The Fibonacci sequence is defined as follows:**

$Fib(1)=Fib(2)=1$

$Fib(n)=Fib(n-1)+Fib(n-2)$ **for** $n>=3$

It can be shown that:

$$Fib(n)=\{ [(1+\sqrt{5})/2]^{n}-[(1-\sqrt{5})/2]^{n} \}/\sqrt{5}$$

Find Fib(10), both by direct method and using the above equation. *10%*

2- **Simulate the Gamma distributed random variables, *G*, with EMBED Equation.3 for *n=3*, EMBED Equation.3 from the following uniform distributed random variables, *U(0,1):***

U1=0.95, U2=0.23, U3=0.60, *10%*

(*Hint: See page 82*)

3- **In the following chaotic system:** *10%*

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

If *r=0.5*, find the attractor of this chaotic system.

(*Hint: See chap. 6, page 136*)

Use the table-look-up method to simulate random variables *X* from *U(0,1).*

Where the p.d.f of *X* is: $f(x)=e^{-x}/(1+e^{-x})^{2}$, $-\infty< x<\infty$ *10%*

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

(Hint: see page 95-96)

5- **Simulate a Binomial random variable *X* with *B(8,0.65)* from a set of uniform**

random variables *U (0,1)*, by using Bernouli random variable, where:
U1=0.48, U2=0.89, U3=0.76, U4=0.45, U5=0.02, U6=0.82, U7=0.44, U8=0.62

10%

(Hint: See page 82)

p=0.65

***6-* In randomised response technique (RRT), if we have p_0=0.4 for answering *[N]*, *(1-p_0=0.6)* for answering *[E]* and *Pr[Yes|N]=0.9*, and total probability from survey is: *Pr[Yes]=0.72*, what is the *Pr[Yes| E]*?**

(Hint: See page 51) *10%*

***7-* Simulate the normal distributed random variables *(N1, N2)* by using Polar-Marsaglia method (rejection method) from each pair of the following uniform distributed random variables:** *(Hint: See page 80)*
(V1,V2)=(0.1,-0.2) , (V1,V2)=(0.5,0.9), (V1,V2)=(0.8,-0.6)

10%

8-*Simulate random variable *X* with geometric distribution and *p=0.2* from *U(0,1) =0.486

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

9- **In estimation of πby integral method. Compare the variances of Hit-or-Miss Monte Carlo and Crude Monte Carlo methods. Which one has the lower variance.**

(Hint: See page 162-165)

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X=

X|u=0.5 =

(N1,N2)= , (N1,N2)= , (N1,N2)=

x(∞)=

X=

Var (R)=

Var(I)=

Pr[Yes | E] =

X=

Fib(10) =

G=