Simulation Exam Name: **University of the Ryukyus**
3-rd year undergraduate No: **Faculty of Engineering**
2010-2-8 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:** $x_{n+1} = 17\, x_n + 3, (\bmod \;\; 8)$

Simulate the following cycles with seed $x_0 = 1$**. How many cycles does it have?**

x(0)=1 ,x(1)= ,x(2)= ,x(3)= ,x(4)= , x(5)= ,x(6)= ,x(7)=

10%

(Hint: See page 60-61)

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

Pr[Yes|N]=0.8 (answering probability to non-embarrassing question).
Pr[Yes]=0.9 (total probability from survey).
p_0 =0.4 **(**probability for answering to non-embarrassing question).
Find Pr[Yes|E]=*?* (answering probability to embarrassing question).

(Hint: See page 51) *10%*

Pr[Yes|E]=

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

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

If *r=0.75*, find the attractor of this chaotic system.

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

x(**∞**)=

4- **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%*

Fib(10) =

5- Simulate a Binomial random variable X with B(8,0.6) from a set of uniform random variables U (0,1), by using Bernouli random variable, where:
U1=0.1, U2=0.8, U3=0.9, U4=0.2, U5=0.3, U6=0.7, U7=0.5, U8=0.4 *10%*

(Hint: See page 82)

X=

p=0.6

***6*- If y=exp(-x) and x is a random variable with the exponential p.d.f f(x)=exp(-x), then find the probability density function (p.d.f) of random variable, f(y).**

(*Hint: See page 33*) *10%*

f(y) =

***7*- Simulate the Gamma distributed random variables, G, with $\Gamma(n,\lambda)$ for n=5, $\lambda = 0.5$ from the following uniform distributed random variables, U(0,1):**
U1=0.9, U2=0.7, U3=0.6, U4=0.2, U5=0.4 *10%*

(*Hint: See page 82*)

G=

***8*- Simulate a Poisson distribution random variable, K, with parameter λ=1 from the following uniform random variables: U={0.7, 0.8, 0.9, 0.5}**

(Hint: See page 84) *10%*

K=

***9*- 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)=(-0.7,0.9) , (V1,V2)=(-0.2,0.4), (V1,V2)=(-0.6,-0.8)

10%

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

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