Simulation Exam Name:	University of the Ryukyus
3-rd year undergraduate No:	Faculty of Engineering
2011-2-4 Last Term Examination	Department of Information Eng.
Time: 90 minutes (write answers in boxes)	Prof. M.R. Asharif
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1- If $y=x^2$ and x is a random variable with the normal p.d.f, that is:

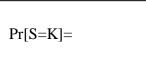
$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}$$

Then, find the probability density function (p.d.f) of random variable, y: f(y). 100/

(*Hint: See page 33*)

	10%
$\mathcal{C}(\mathbf{x})$	
f(y) =	

2- 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: $Pr[X=i] = q^{i-1} p$ and $Pr[Y=i] = q^{i-1} p$ (*Hint: See page 38*) 10%



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

Pr[Yes|N]=0.2 (answering probability to non-embarrassing question). **Pr[Yes]=0.6** (total probability from survey). (probability for answering to non-embarrassing question). $p_0 = 0.5$ **Find Pr[Yes|E]=?** (answering probability to embarrassing question). (*Hint: See page 51*) 10%

Pr[Yes|E] =

4-The first pseudo-random number generator proposed by Von Neuman (1951) was the "mid-square (MS)" such that:

X(0)=7777, $x(1) = MS(7777)=Mid(7777)^{2}=60481729=4817$ Find the first five numbers.

x(0)=7777, x(1)=4817, x(2)=,x(3)=,x(4)=,x(5)= 10%

(*Hint: See page 71*)

5- In the following iterative function: $a(n+1)=[a(n)]^2-0.75$ If a(0)=0.5i, where $i=\sqrt{-1}$, find the attractor of this function, $a(\infty)$. (*Hint: See Julia Sets*) $a(\infty)=$

6- Simulate the normal distributed random variables (N1, N2) by using Box-Muller method from the following pair of uniform distributed random variables: (U1,U2)=(0.8825,0.5) (Hint: See page 78 use Eq. 4.1)

_	-	-	10%
	(N1,N2)=		

7- Simulate the Gamma distributed random variables, G, with $\Gamma(n, \lambda)$ for n=5, $\lambda = 0.25$ from the following uniform distributed random variables, U(0,1): U1=0.9, U2=0.8, U3=0.7, U4=0.81, U5=0.9 (Hint: See page 82)

8- Two independent uniform random numbers with U(0,1) are given in the binary form as below: U1=0.10101010 U2=0.01111011
Simulate the binomial distribution B(8,1/2) random variables, X1, from U1 and X2, with B(8,1/4) from U1 and U2. 10%

(*Hint: See page 83*)

X1= X2=	X1= X2=		
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9- Simulate random variable X with geometric distribution and p=0.2 from U(0,1)=0.74

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

10%

9- 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 as follows:

$f(x)=e^{-x}/(1+e^{-x})^2$,	<i>- ∞< x< ∞</i>	10%
Also, find the value of X when U=0.5 (Hint: see page 95-96)	X=X u=0.5	=