

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

1- In the mixed congruential generator:

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

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

$x(0)=1,$ $x(1)=$ $,x(2)=$ $,x(3)=$ $,x(4)=$ $,x(5)=$	10%
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(Hint: See page 58-61)

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

$$X = -\log_e U \quad \text{with } U(0,1) \quad 10\%$$

(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%
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(Hint: See page 78 Eq. 4.1)

4- In Poisson distribution, if $\lambda = 5$, find: $\Pr[x=5]=?$, $E[x]=?$ and $\text{Var}[x]=?$

$\Pr[x=5]=$ $E[x]=$ $\text{Var}[x]=$

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

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

$\Pr[\text{Yes}|N]=0.8$ (answering probability to non-embarrassing question).

$\Pr[\text{Yes}]=0.8$ (total probability from survey).

$p_0=0.6$ (probability for answering to non-embarrassing question).

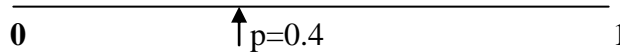
Find $\Pr[\text{Yes}|E]=?$ (answering probability to embarrassing question).

(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=



- 7- Simulate a Poisson distribution random variable, K , with parameter $\lambda=0.5$ 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 $p=0.3$ from $U(0,1)=0.34$
 (Hint: See page 93 Eq. 5.4)

10%
 X=
