Department of Systems Engineering & Operation Research

George Mason University

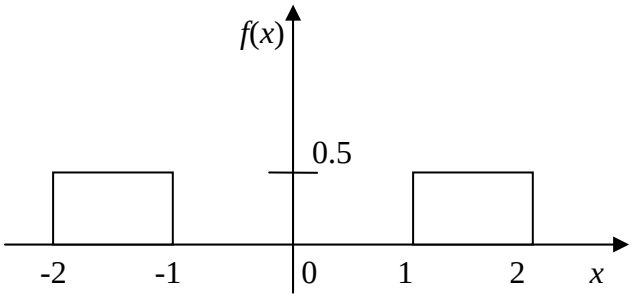
OR 635 Discrete System Simulation

Prof. Chun-Hung Chen Fall 2009

Practice Examination

Discussion: In class on Wednesday, October 28

1. Develop a generator for the following density function:



(a) Use Acceptance-Rejection Method,

(b) Use Inverse Transform Method,

(c) Use Composition Method

2. Give an algorithm to generate X, which is a discrete random variate

P(X=1) = 0.05
P(X=2) = 0.1
P(X=3) = 0.1
P(X=4) = 0.3
P(X=5) = 0.45

3. This question is about generation of Normal random variates. Suppose you are given two Uniform random numbers 0.1 and 0.5. Please use these two numbers to generate two normal $N(2, 1^2)$ random variates using the original Polar method.

4. Suppose you are asked to simulate a network and analyze the mean system time. After you have obtained 1000 observations, the 90% confidence interval is [0.8, 1.2]. If our goal is to obtain a 80% confidence interval [0.9, 1.1], do you need to run more simulations for additional observations? If not, please explain. If so, approximately, how many additional observations do you have to get? (Critical points: $z_{0.8} = 0.8$, $z_{0.9} = 1.2$, $z_{0.95} = 1.6$, $z_{0.975} = 2.0$, $z_{0.99} = 2.3$).

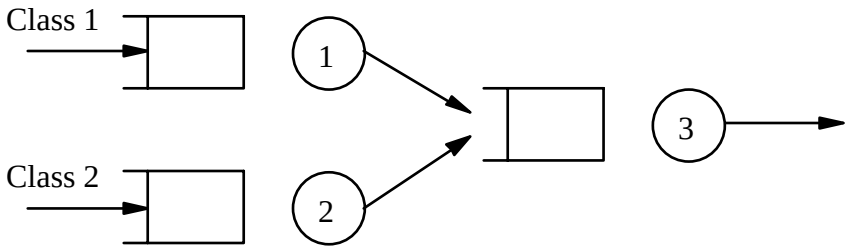
5. Consider a three-node system with two classes of customer arrivals shown on next page. The sizes of the waiting buffer space at all nodes are infinite. The event times are:

Interarrival times for Class 1 customers: 20,

Interarrival times for Class 2 customers: 21,

Service times for Class 1 (at all nodes): 5,

Service times for Class 2 (at all nodes): 7,



System state: x_1: the number of customers at node 1,

x_2: the number of customers at node 2,

x_3: the number of Class 1 customers at node 3,

x_4: the number of Class 2 customers at node 3,

Events: a1: arrival event at node 1,

a2: arrival event at node 2,

d1: departure event at node 1,

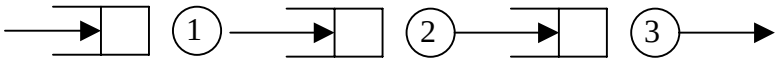
d2: departure event at node 2,

d3: departure event at node 3,

Simulate this system by filling the following table. Stop this simulation when simulation clock (t) is no less than 50.

		System States				Event List				
t	e'	x_1	x_2	x_3	x_4	a1	a2	d1	d2	d3
0	INI	0	0	0	0	20	21			
20	a1	1	0	0	0	40	21	25		

6. Consider the following three-stage service system:



Each customer will be served by a receptionist at stage 1. The customer at stage 2 and 3 will be served by a SAME special agent. There is one receptionist and three special agents. Please construct an Arena model for this simulation using the following modules. In some modules, you have to enter more information in the parentheses. Note that there are 4 types of Process modules. The difference is their action in the logic: D for Delay, SDR for Seize-Delay-Release, SD for Seize-Delay, and DR for Delay-Release. Please use the right process modules and enter the corresponding information.

Create	Dispose

Assign	**Decide**
(*Assignments*)	(*if condition*)

Process-D	**Process-SDR**	**Process-SD**	**Process-DR**
(*Resource Name*) (*Quantity*)	(*Resource Name*) (*Quantity*)	(*Resource Name*) (*Quantity*)	(*Resource Name*) (*Quantity*)

Resource	
(*Name*)	(*Capacity*)