Department of Systems Engineering & Operation Research
George Mason University

OR 335/SYST 335 Discrete Systems Simulation Modeling

Prof. Chun-Hung Chen Spring 2009

Practice Examination

Discussion: Monday, March 23

1. Develop a generator for the following density function:

$$f(x) = \frac{3x^2}{2}, \text{ if } -1 \le x \le 1$$
$$= 0, \text{ otherwise}$$

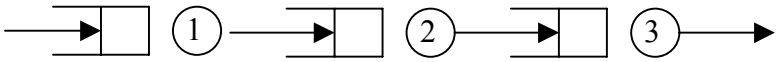
(a) Use Acceptance-Rejection Method,

(b) Use Inverse Transform Method.

2. You are given two Unif(0,1) random numbers: 0.2 and 0.5. Please use these two random numbers and apply Polar method to generate two numbers which are normally distributed with mean 1 and standard deviation 2, i.e., $N(1, 2^2)$.

3. Consider the LCG $\{ Z_i = (5 * Z_{i-1} + 7) \bmod 10 \}$ with $Z_0 = 5$, what is its period?

4. 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*)

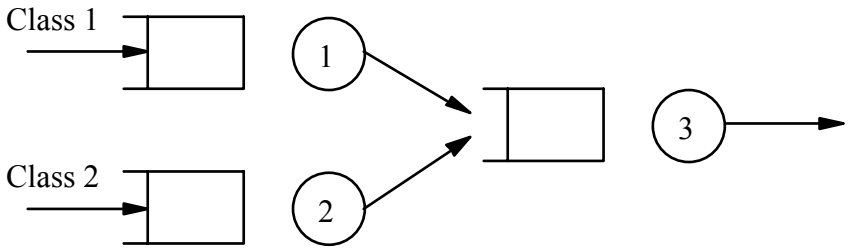
5. Consider a three-node system with two classes of customer arrivals shown on next page. The sizes of the waiting buffer space at all nodes are infinite. The event times are:

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,

(a) Write the formula for getting the triggering event (e' = arg min { …..})

(b) Give the state transition for each triggering event.

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

(d) Consider batch arrival: each arrival at Node 1 has 3 customers; each arrival at Node 2 has 2 customers. Write the formula for getting the triggering event.

		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		