Exercise 1:

What is the mean number of agents in the system which can be generalized by a $M/M^{[K]}/1$ queue model with $\lambda = 3\mu$, and the bulk departure size $K = 4$?
a) 6
b) 8
c) .1118
d) .8882

Solution:

The operator equation is

$$r^5 - 4r + 3 = 0,$$

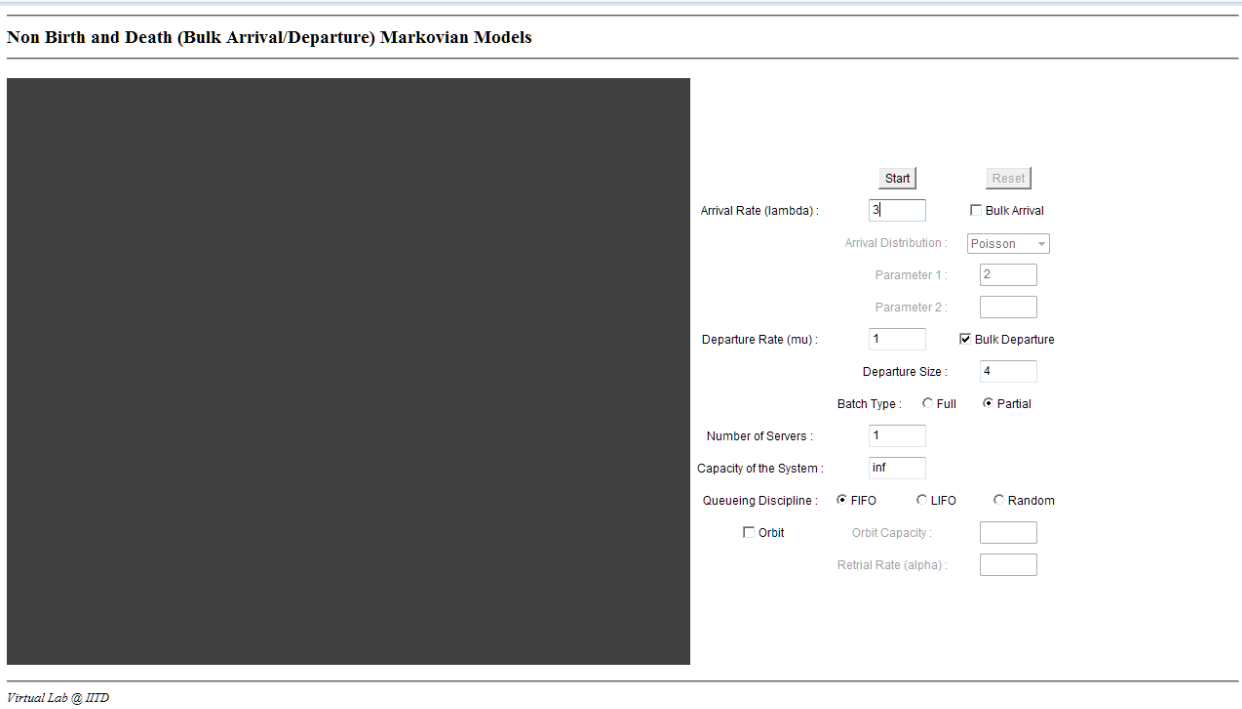
giving us the following roots:
1.000
-1.5600
0.8882
-0.1641 - 1.4623i
-0.1641 + 1.4623i

We only consider the real positive root with modulus less than one, i.e. 0.8882.
The mean number of agents in the system is now $L = 0.8882 / (1 - 0.8882) = 7.9445$

Hence, the correct answer is b), i.e. 8.

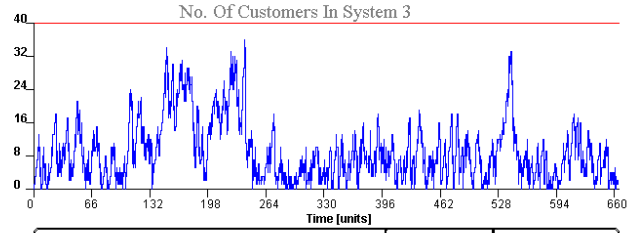
For a simulation of the system, perform the following steps:

→ Open the page where the simulation is to be performed.
→ Next feed the data as shown.



→ Click Start. The applet will now generate a sample path for the queue.

Non Birth and Death (Bulk Arrival/Departure) Markovian Models



Performance Measures	Run Time (till t=665)	Steady State (Theoretical)
Mean No. of Customers in the System	8.925	N/A
Mean No. of Customers in Queue	6.028	N/A
Mean Waiting Time In Queue	2.081	N/A
Mean Sojurn Time In System	3.081	N/A
Utilisation	2.897	N/A
Throughput	2.891	N/A
Blocking Probability	0.0	N/A