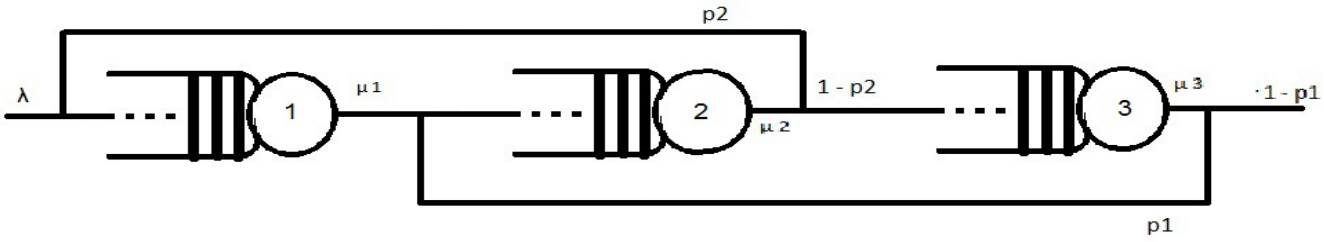
Example:

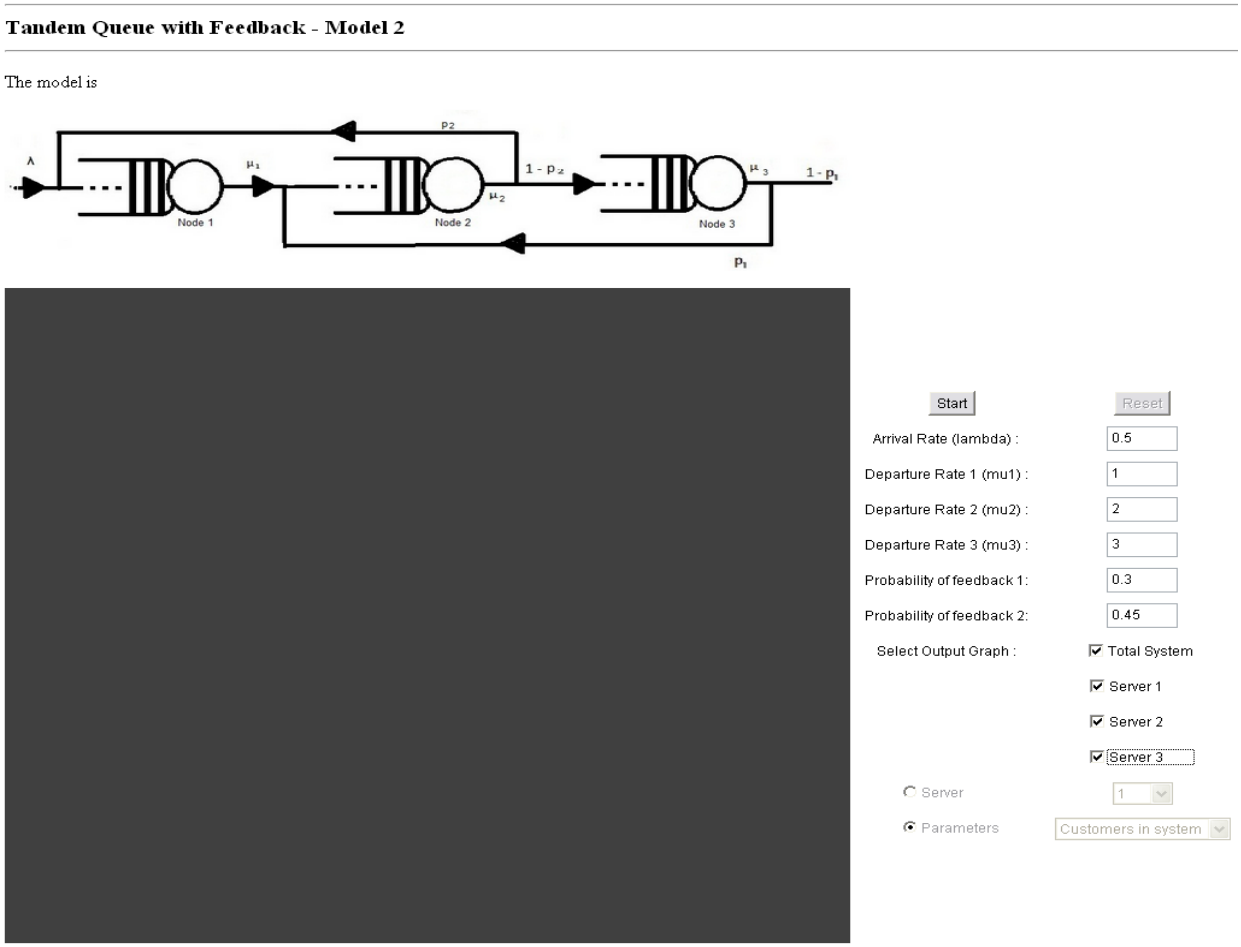
Consider a repair facility shared by a large number of machines, such that each machine has three sequential stages of repair. The machines arrive at the repair facility at the rate of 0.5/hr. The repair rate at three stages is 1/hr, 2/hr and 3/pr respectively. It is further assumed that if the repair at node 2 is not successful, the probability being 0.45, then the machine rejoins the queue of node 1. Similarly, if the machine is not successfully repaired at node 3, then it joins the queue of node 2. The probability of the machine not being successfully repaired at node 3 is 0.3. The capacity of the queue at each node is assumed to be infinite. Obtain the measures of effectiveness for such a system given that the system can be modeled as a tandem queue with feedback as shown in the diagram below:



Solution:

The arrival rate of the customer is $\lambda = 0.5$ and the service rate at node i is i/hr. In order to obtain the measures of effectiveness, in steady state as well as via simulation, we follow the steps as shown below:

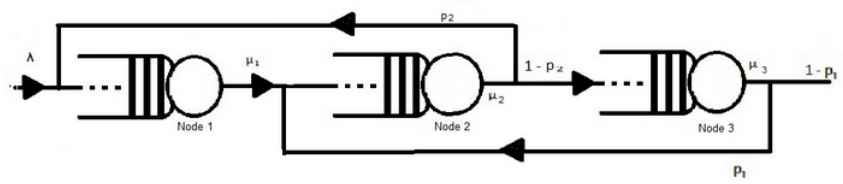
- Open the page where the experimentation is to be performed
- Feed the data as shown:



- Next, click on the **'Start'** button to obtain the desired measures of effectiveness

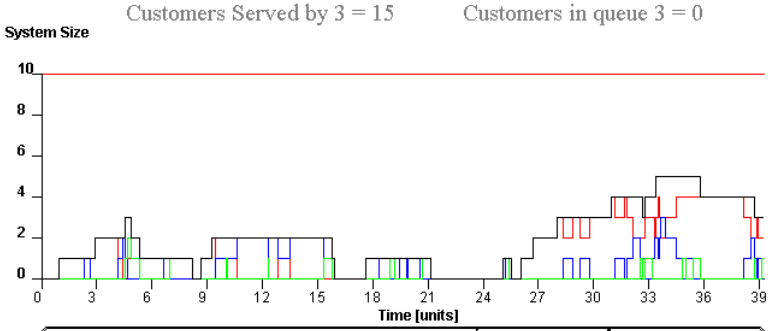
Tandem Queue with Feedback - Model 2

The model is



Customers Entered = 13
Customers Served by 1 = 22
Customers Served by 2 = 27
Customers Served by 3 = 15

No. Of Customers In System = 3
Customers in queue 1 = 1
Customers in queue 2 = 0
Customers in queue 3 = 0



Performance Measures	Run Time *(till t=40)*	Steady state *(Theoretical)*
Mean No. of Customers in the System	2.435	N/A
Mean No. of Customers in the System 1	1.5	N/A
Mean No. of Customers in the System 2	0.679	N/A
Mean No. of Customers in the System 3	0.256	N/A

Pause | Reset

Arrival Rate (lambda) : 0.5
Departure Rate 1 (mu1) : 1
Departure Rate 2 (mu2) : 2
Departure Rate 3 (mu3) : 3
Probability of feedback 1: 0.3
Probability of feedback 2: 0.45

Select Output Graph : ☑ Total System ☑ Server 1 ☑ Server 2 ☑ Server 3

○ Server 1

◉ Parameters Customers in system

- In the simulator, we are able to see graphs of the number of customer at each node (since Server1, Server 2 and Server 3 are ticked on the right side of the window)
- We also see an option for **'Parameters'** from where we can choose the measure of effectiveness required.