 shahinjaffer07 / **Open-Jacson-Networks**   Public

forked from ramjan1729/Open-Jacson-Networks

 BSD-3-Clause license

 0 stars   **909** forks   Branches   Tags Activity

Star	

 Notifications

<> **Code**   Pull requests   Actions   Projects   Security   Insights

main ▾ | ⑂ 1 Branch ⬨ 0 Tags | ⑂ ⬨ | 🔍 Go to file | Go to file | Code | ⋯

This branch is 1 commit ahead of ramjan1729/Open-Jacson-Networks:main .

shahinjaffer07 Update README.md   1 minute ago ⋯ 🕘

| 📄 LICENSE | Initial commit | 2 years ago |
| 📄 README.md | Update README.md | 1 minute ago |

📖 README   ⚖️ License   ☰

Series Queues with infinite capacity - Open Jackson Network

Aim :

To find (a) average number of materials in the system (b) average number of materials in the each conveyor of (c) waiting time of each material in the system (d) waiting time of each material in each conveyor, if the arrival of materials follow Poisson process with the mean interval time 12 seconds, service time of lathe machine in series follow exponential distribution with service time 1 second, 1.5 seconds and 1.3 seconds respectively and average service time of robot is 7 seconds.

Software required :

Visual components and Python

Theory

Open Jackson Networks

An open Jackson network is a system of k service stations where station $i (i = 1,2,3,...,k)$ has the following characteristics.

(i)   An infinite queue capacity

(ii)   Customer arrive at station i from outside of the system according to a Poisson processes with parameter r_i.

(iii) C_i servers at station i with an exponential service time distribution with parameter μ_i

(iv)   Customers completing service at station i next go to station j.

(v)   Let λ_j denote the total arrival rate of customers to the station S_j. Then the traffic flow equation is

$$\lambda_j = r_j + \sum_{i=1}^{m} \lambda_i p_{ij}$$

Procedure :

1. Average number of customers in the system S_j is $L_{S_j} = \dfrac{\lambda_j}{\lambda_j - \mu_j}$

2. Average number of customers in the overall system $L_S = \sum_{j=1}^{k} L_{S_j}$

3. Average waiting time in the system $W_S = \dfrac{L_s}{r_1 + r_2 + \cdots + r_k}$

Experiment:

Program

DEVELOPED BY :SHAHIN J REGISTER NO : 212223040190 Department: CSE

```
arr_time=float(input("Enter the mean inter arrival time of objects from Feeder (in
secs): "))
ser_time1=float(input("Enter the mean  inter service time of Lathe Machine 1 (in
secs) :  "))
ser_time2=float(input("Enter the mean  inter service time of Lathe Machine 2 (in
secs) :  "))
ser_time3=float(input("Enter the mean  inter service time of Lathe Machine 3 (in
secs) :  "))
Robot_time=float(input("Enter the Additional time taken for the Robot (in secs) :
"))
lam=1/arr_time
mu1=1/(ser_time1+Robot_time)
mu2=1/(ser_time2+Robot_time)
mu3=1/(ser_time3+Robot_time)
print("------------------------------------------------------------------------")
print("Series Queues with infinite capacity- Open Jackson Network")
print("------------------------------------------------------------------------")
if (lam <  mu1) and (lam <  mu2) and (lam <  mu3):
    Ls1=lam/(mu1-lam)
    Ls2=lam/(mu2-lam)
    Ls3=lam/(mu3-lam)
    Ls=Ls1+Ls2+Ls3
    Lq1=Ls1-lam/mu1
    Lq2=Ls2-lam/mu2
    Lq3=Ls3-lam/mu3
    Wq1=Lq1/lam
    Wq2=Lq2/lam
```

```
              wq2=Lq2/lam
              Wq3=Lq3/lam
              Ws=Ls/(3*lam)
              print("Average number of objects in the system S1 : %0.2f "%Ls1)
              print("Average number of objects in the system S2 : %0.2f "%Ls2)
              print("Average number of objects in the system S3 : %0.2f "%Ls3)
              print("Average number of objects in the overall system    : %0.2f "%Ls)
              print("Average number of objects in the conveyor S1  :  %0.2f "%Lq1)
              print("Average number of objects in the conveyor S2  :  %0.2f "%Lq2)
              print("Average number of objects in the conveyor S3  :  %0.2f "%Lq3)
              print("Average waiting time of an object in the conveyor S1 : %0.2f secs"%Wq1)
              print("Average waiting time of an object in the conveyor S2 : %0.2f secs"%Wq2)
              print("Average waiting time of an object in the conveyor S3 : %0.2f secs"%Wq3)
        else:
              print("Warning! Objects Over flow will happen in the conveyor")
        print("---------------------------------------------------------------------")
```

Output

```
Enter the mean inter arrival time of objects from Feeder (in secs): 12
Enter the mean  inter service time of Lathe Machine 1 (in secs) :  1
Enter the mean  inter service time of Lathe Machine 2 (in secs) :  1.5
Enter the mean  inter service time of Lathe Machine 3 (in secs) :  1.3
Enter the Additional time taken for the Robot (in secs) :  7
----------------------------------------------------------------------
Series Queues with infinite capacity- Open Jackson Network
----------------------------------------------------------------------
Average number of objects in the system S1 : 2.00
Average number of objects in the system S2 : 2.43
Average number of objects in the system S3 : 2.24
Average number of objects in the overall system    : 6.67
Average number of objects in the conveyor S1  :  1.33
Average number of objects in the conveyor S2  :  1.72
Average number of objects in the conveyor S3  :  1.55
Average waiting time of an object in the conveyor S1 : 16.00 secs
Average waiting time of an object in the conveyor S2 : 20.64 secs
Average waiting time of an object in the conveyor S3 : 18.62 secs
```

Result

The average number of material in the sysytem and in the conveyor and waiting time are successfully found.

Releases

No releases published

Packages

No packages published