



Cairo University
Faculty of Computers and Artificial Intelligence
Department: Operations Research and Decision Support
Course Name: Systems Modeling and Simulation
2022 Course Code: DS331/DS241
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IDs:20190420_20190182_20190649

Bank Multi-Channel Queue

Summary:

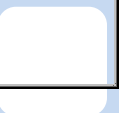
Steps for solving this problem

1-forming cumulative table

2-forming calendar

3-calculating the required data

4-compare the calculated data with the output of the code



Cumulative tables

Table 1		Table 2	
Time between Arrivals (Minutes)	Probabilities	Service Time (Minutes)	Probabilities
0	0.09	1	0.20
1	0.19	2	0.40
2	0.30	3	0.28
3	0.21	4	0.12
4	0.12		
5	0.09		

Table 1 cumulative

Time between Arrivals (Minutes)	Probabilities
0	0.09
1	0.28
2	0.58
3	0.79
4	0.91
5	1

Table 2 cumulative

Service Time (Minutes)	Probabilities
1	0.2
2	0.6
3	0.88
4	1

Calendar:

ATime	STime	SSTime	Wait1	Wait2	F.Time1	F.Time
0	2	0	0	0	2	-
2	3	2	0	0	5	-
5	4	5	0	0	9	-
8	2	9	1	0	11	-
11	3	11	0	0	14	-
16	1	16	0	0	17	-
20	1	20	0	0	21	-
21	1	21	0	0	22	-
23	2	23	0	0	25	-
24	4	25	1	0	29	-

Calculations:

The average service time of driver-in teller = $23/10=2.3$

The average service time of inside-bank teller = $0/10=0.0$

The average waiting time in the drive-in teller = $(1+1)/10=0.2$

The average waiting time inside-bank teller = 0.0

The maximum inside-bank teller queue length = 0

The probability that a customer waits in the inside-bank teller queue 0.0

The portion of idle time of the inside-bank teller 29.0

By comparing this calculation by the output of the code in the below photo we get the same output

```
enter number of runs :1
serv 2
3 serv 2 arriv
4 serv 5 arriv
2 serv 8 arriv
3 serv 11 arriv
1 serv 16 arriv
1 serv 20 arriv
1 serv 21 arriv
2 serv 23 arriv
4 serv 24 arriv
The avareg service time of driver-in teller 2.3
The avareg service time of inside-bank teller 0.0
The average waiting time in the drive-in teller 0.2
The average waiting time inside-bank teller 0.0
The maximum inside-bank teller queue length 0
The probability that a customer wait in the inside-bank teller queue 0.0
The portion of idle time of the inside-bank teller 29.0
```

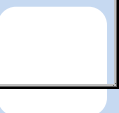
According to the last slide

The solution of question

6- Does the theoretical average service time of the service time distribution match with the experimental one

7- Does the theoretical average inter-arrival time of the inter-arrival time distribution match with the experimental one?

Is yes



Problem formulation & Objectives:

In this problem we are going to simulate the in-driver teller and bank teller behavior neglecting the parking area of the bank and the hall size of the bank and how many customers it rooms for

System Components:

- The que size of the in-driver teller
- The time between arrivals of customers
- Service time