

Lab work 1

- a. Customers arrive in a bank according to a Poisson's process with mean inter arrival time of 10 minutes. Customers spend an average of 5 minutes on the single available counter, and leave. Write a program in C to find:
 - I. Probability that a customer will not have to wait at the counter.
 - II. Expected number of customers in the bank.
 - III. Time can a customer expect to spend in the bank.

Lab work 2

- a. WAP to compute PI using Monte Carlo method using c programming language.
- b. In a single pump service station, vehicles arrive for fueling with an average of 5 minutes between arrivals. If an hour is taken as unit of time, cars arrive according to Poison's process with an average of $\lambda = 12$ cars/hr. Write a C program to generate Poisson distribution for $x = 0, 1, 2, \dots, 15$.

$$f(x) = \Pr(X=x) = \frac{e^{-\lambda} \lambda^x}{x!} = \frac{e^{-12} 12^x}{x!}, \begin{cases} x = 0, 1, 2, \dots \\ \lambda > 0 \end{cases}$$

Lab work 3

- a. Weather Problem:

raining today \Rightarrow 40 % rain tomorrow

\Rightarrow 60 % no rain tomorrow

not raining today \Rightarrow 20 % rain tomorrow

\Rightarrow 80 % no rain tomorrow

What will be probability if today is not raining then not rain the day after tomorrow?

Write a C program to find the weather of the next day by using Markov Chain Method.

Lab work 4

- a. Let $m = 100$, $a = 19$, $c = 0$, and $X_0 = 63$, and generate a sequence random integer. WAP to find first 7 random number generate using any suitable method?
- b. WAP to use mixed congruential method to generate a sequence of 10 five-digit random integers and corresponding random variables. Let $x_0 = 4$, $a=3$ and $c=2$.
- c. WAP to use Multiplicative congruential method to generate a sequence of 10 three-digit random integers and corresponding random variables. Let $x_0 = 5$, $a=3$ and $c=2$.

Lab work 5

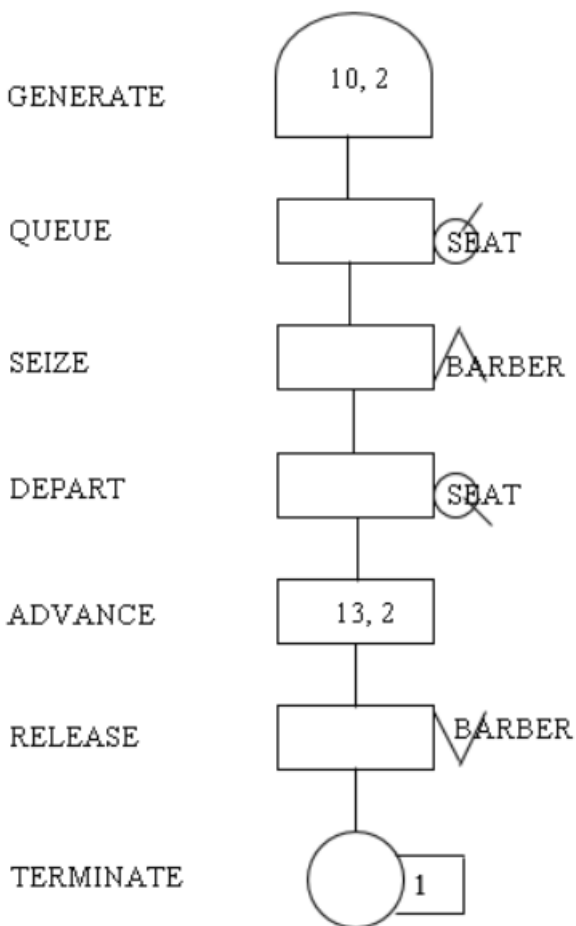
- Implementation of autocorrelation function in c programming
- Implementation of gap test function in c programming
- Implement KS test in c programming.
- Implementation of chi square test function in c programming

Lab work 6

- Create a GPSS model and program to simulate a barber shop for a day (9am to 4pm), where a costumer enters the Shop every 10 ± 2 minute and a barber takes 13 ± 2 for a haircut.

Solution

GPSS model to simulate a barber shop



Program:

```
GENERATE 10,2  
QUEUE SEAT  
SEIZE BARBER
```

DEPART SEAT
 ADVANCE 13,2
 RELEASE BARBER
 TERMINATE
 TIMER GENERATE 420
 TERMINATE 1

Output

GPSS World Simulation Report - Untitled Model 1.1.1

Saturday, September 09, 2023 21:48:47

START TIME	END TIME	BLOCKS	FACILITIES	STORAGES
0.000	420.000	9	1	0

NAME	VALUE
BARBER	10001.000
SEAT	10000.000
TIMER	8.000

LABEL	LOC	BLOCK TYPE	ENTRY COUNT	CURRENT COUNT	RETRY
	1	GENERATE	43	0	0
	2	QUEUE	43	12	0
	3	SEIZE	31	0	0
	4	DEPART	31	0	0
	5	ADVANCE	31	1	0
	6	RELEASE	30	0	0
	7	TERMINATE	30	0	0
TIMER	8	GENERATE	1	0	0
	9	TERMINATE	1	0	0

FACILITY	ENTRIES	UTIL.	AVE. TIME	AVAIL.	OWNER	PEND	INTER	RETRY
DELAY								
BARBER	31	0.973	13.182	1	32	0	0	12

QUEUE	MAX CONT.	ENTRY	ENTRY(0)	AVE.CONT.	AVE.TIME	AVE.(-0)	RETRY
SEAT	12	12	43	1	4.927	48.123	49.269 0

FEC	XN	PRI	BDT	ASSEM	CURRENT	NEXT	PARAMETER	VALUE
32	0		421.538	32	5	6		
45	0		425.297	45	0	1		
46	0		840.000	46	0	8		

2. A machine tool in a manufacturing shop is turning out parts at the rate of every 5 minutes. When they are finished, the parts are sent to an inspector, who takes 4 ± 3 minutes to examine each one and rejects 15% of the parts. Draw and explain a block diagram and write a GPSS program to simulate using the concept of facility.
3. A machine tool in a manufacturing shop is turning out parts at the rate of every 5 minutes. When they are finished, the parts are sent to an inspector, who takes 4 ± 3 minutes to examine each one and rejects 20% of the parts. Draw and explain a block diagram for it and write a GPSS program to simulate using the concept of FACILITY.
4. We are modeling a barber shop with the following qualities:
 - The shop contains one barber and one barber's chair, open for eight hours in a day.
 - Customers arrive on average every 18 minutes, with the arrival time varying between 12 and 24 minutes.
 - If the barber is busy, the customer will wait in a queue.
 - Once the barber is free, the next customer will have a haircut.
 - Each haircut takes between 12 and 18 minutes, with the average being 15 minutes.
 - Once the haircut is done, the customer will leave the shop.

We want to answer these questions:

- How utilized is the barber through the day?
 - How long does the queue get?
 - On average, how long does a customer have to wait.
5. Consider that a machine tool in a manufacturing shop is turning out parts at the rate of one every 5 minutes. As they are finished, the parts go to an inspector, who takes 4 ± 3 minutes

to examine each one and rejects 10% of the parts. Now, develop a block diagram and write the code for simulating the above problem using GPSS, and also explain the function of each block used in the block diagram in detail.