Unit II

GPSS

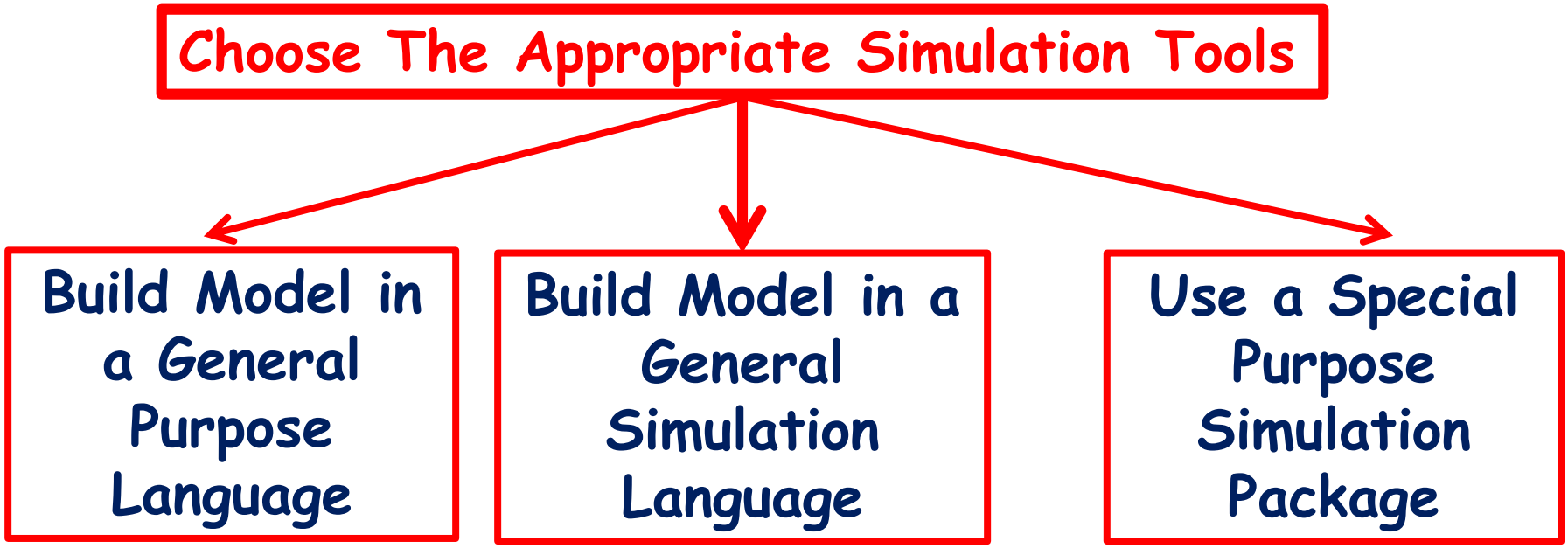
Unit II

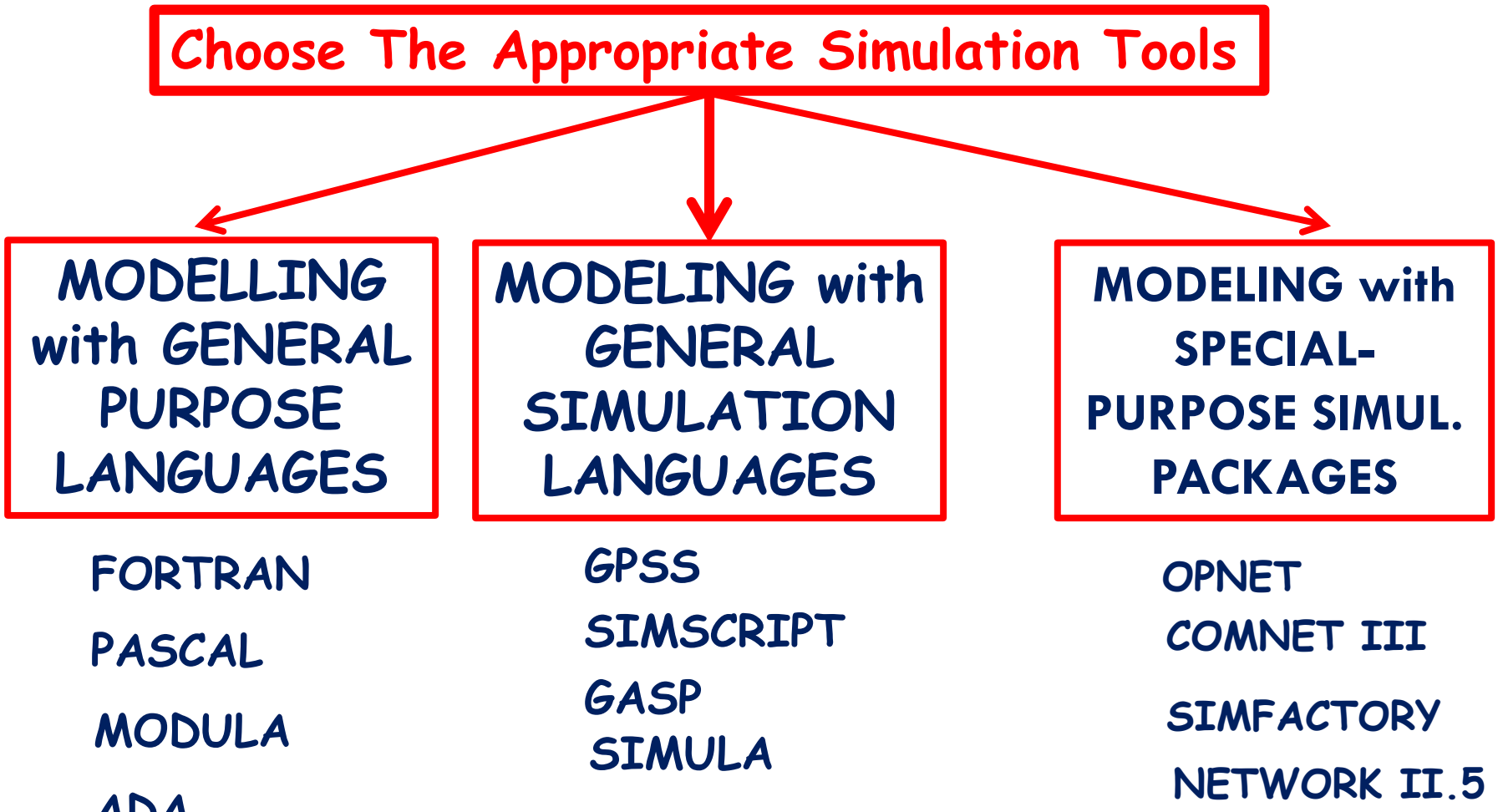
- GPSS:
  - Model Structure
  - Entities and Transactions
  - Blocks in GPSS
  - Process Oriented Programming
  - User Defined Functions
  - SNA
  - Logic Switches
  - Save Locations
  - User Chains
  - Tabulation of Results
  - Programming examples

Unit II

- Random Number Generation:
  - Congruence Generators
  - Long Period Generators
  - Uniformity and
  - Independent Testing

Assume that Simulation is the appropriate means, then three alternatives exist:




Choose The Appropriate Simulation Tools
MODELLING with GENERAL PURPOSE LANGUAGES
FORTRAN
PASCAL
MODULA
ADA
C, C++
MODELING with GENERAL SIMULATION LANGUAGES
GPSS
SIMSCRIPT
GASP
SIMULA
MODELING with SPECIAL-PURPOSE SIMUL. PACKAGES
OPNET
COMNET III
SIMFACTORY
NETWORK II.5

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MODELING with GENERAL SIMULATION LANGUAGES

GPSS:	General Purpose System Simulator General Purpose Simulation System
SIMSCRIPT:	No Known specific meaning
GASP:	General Activity Simulation Program
SIMULA:	Simulation Language

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Comparison

Criteria	GPSS	SIMSCRIPT	GASP	SIMULA
Orientation:	Process (Transaction)	Event	Event	Process
Data Structure:	Dynamic	Dynamic	Space Reserved	Dynamic
Implementation:	Assembly Language	FORTRAN/ Assembly	FORTRAN/ PL/ I	ALGOL
Time Advance:	Next Event	Next Event For Discrete, Fixed Time step for continuous	Next Event For Discrete, Fixed Time step for continuous	Next Event

What is GPSS?

A discrete time simulation language –
where a simulation clock advances
in discrete steps. (t=1, 3 11, 15, etc)

In GPSS

a system is modeled as
transactions (processes) that;
enter the system and
are passed from one service
(represented by blocks)
to another.

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What is GPSS?

GPSS is a general
process-oriented
simulation software environment.

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What are Features of GPSS?

GPSS is a

highly structured,

special-purpose simulation programming language.

GPSS is based on

the process-interaction approach

And

oriented toward queuing systems.

It is the first process-interaction simulation language.

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What are Features of GPSS?

GPSS can be used to model

any situation where transactions

(entities, customers, units of traffic etc.)

are flowing through a system.

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What is entity in GPSS?

In GPSS,

program elements

are referred to entities.

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What is process in GPSS?

Process defines

how the Transactions

will flow among Entities.

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What is transaction in GPSS?

Transaction is a process

that represents

the real-world system

we are modeling.

Transactions are GPSS objects

such as Customer, Machine parts, vehicle etc.

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Transactions: Examples

Real System	Transactions
Highway	Vehicle
Supermarket	Customer
Maintenance Shop	Parts
Production Process	The Product
Port	Ship
Communication System	Messages

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What is BLOCK IN GPSS?

BLOCK describes
proceeding or the run or flow of the transactions.

Blocks are instructions of the GPSS language.

BLOCKS are

Programming elements of GPSS.

Each block has a name and
specific task to perform.

GENERATE, ADVANCE, SEIZE, RELEASE and TERMINATE are examples of blocks.

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What is BLOCK Diagram IN GPSS?

User translates his/her problem
into a conceptual model,
which is a block diagram.

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Example: Joe's Barber Shop

Joe works alone in his shop.

Customers arrive every 18+-6 minutes. (This describes a or *inter-arrival time* equally distributed in an interval between 12 and 24.)

Arriving customers need half a minute to hang up their coats.

If Joe is available, his service starts.

Otherwise customers have to wait in a queue.

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Example: Joe's Barber Shop

Customers arriving first are served first (FIFO: First In - First Out or FCFS: First Come - First Served).

It takes Joe 15+-3 minutes to serve a customer.

Customers leave his shop as soon as the service is finished.

How long does it take to serve 100 customers?

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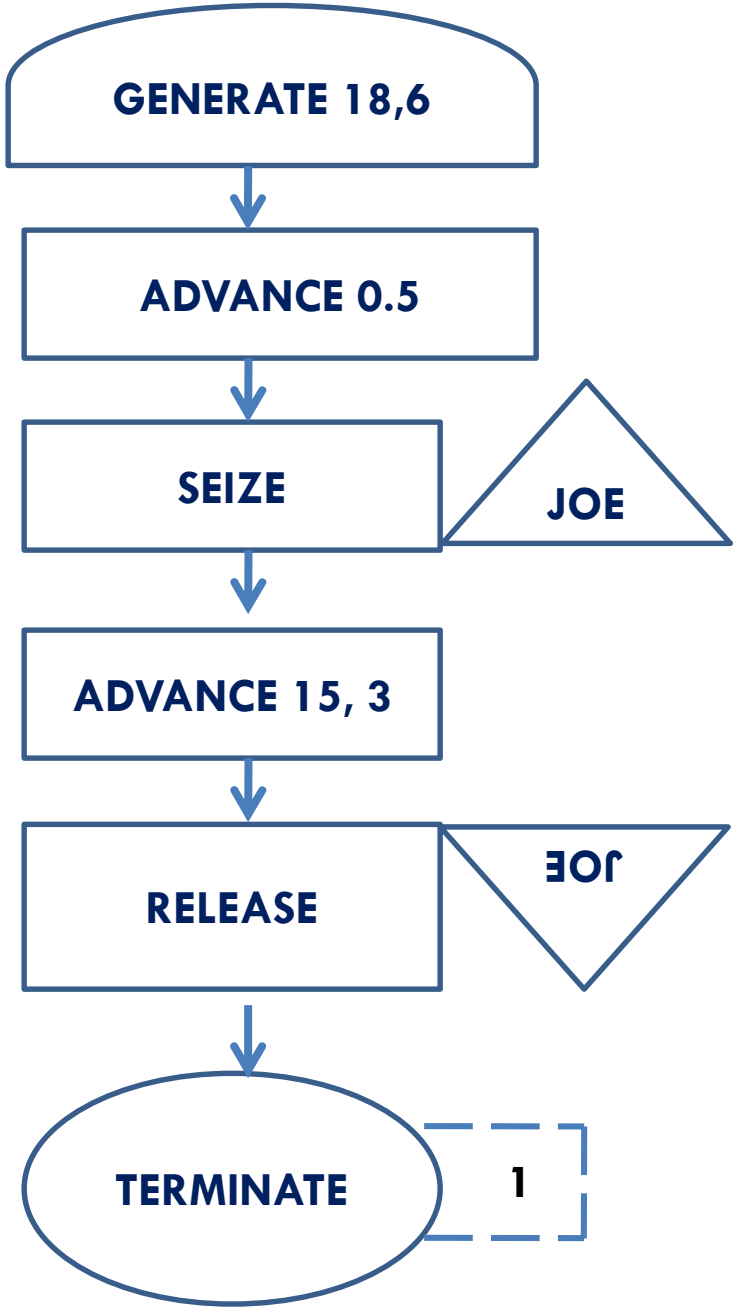
BASIC VERSION OF JOE'S BARBER SHOP
SINGLE-CHANNEL QUEUING SYSTEM

```
GENERATE  18,6;  CUSTOMERS ARRIVE EVERY 18+-6 MINUTES
ADVANCE   0.5; HANG UP COAT
SEIZE     JOE ; WAIT UNTIL JOE IS AVAILABLE
ADVANCE   15,3;  HAVE THEIR HAIR CUT IN 15+-3 MINUTES
RELEASE   JOE;   FREE JOE
TERMINATE 1;  EXIT THE SHOP
START     100
```

BLOCK DIAGRAM



GENERATE 18,6; CUSTOMERS ARRIVE EVERY 18+-6 MINUTES

ADVANCE 0.5 ; HANG UP COAT,

SEIZE JOE ;WAIT UNTIL JOE IS AVAILABLE,

ADVANCE 15,3;HAVE THEIR HAIR CUT IN 15+-3 MINUTES,

RELEASE JOE;FREE JOE

TERMINATE 1 ;EXIT THE SHOP

START 100

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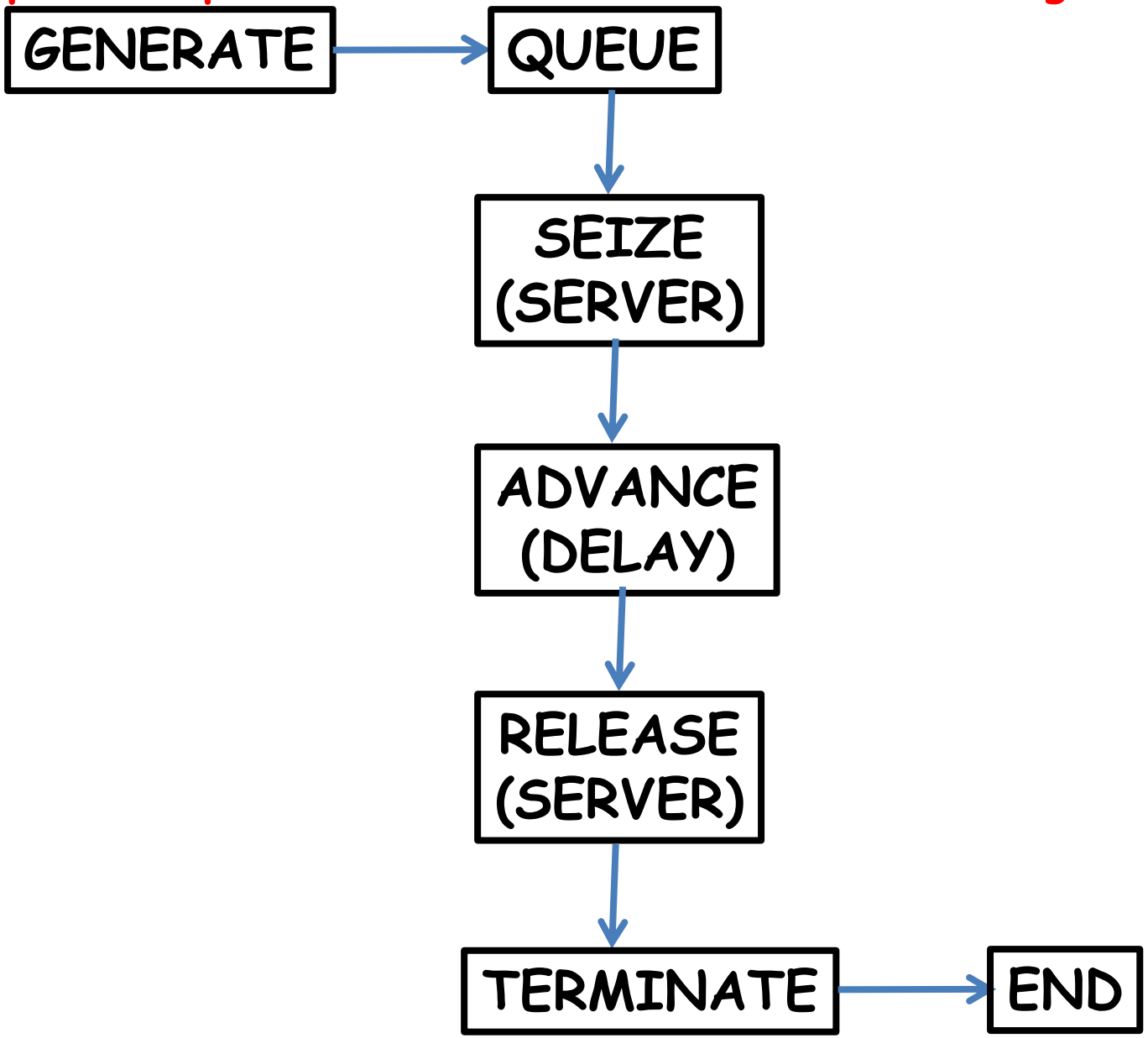
Graphical Representation of BLOCK Structure / Segment / Entities



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GENERATE BLOCK

GENERATE block:	generates transactions
GENERATE 300 ;	creates a transaction every 300 time units
GENERATE 18,6;	CUSTOMERS ARRIVE EVERY 18+-6 MINUTES

ADVANCE BLOCK

An ADVANCE Block delays the progress of a Transaction for a specified amount of simulated time.

ADVANCE A,B

ADVANCE 101.6,50.3

This example creates a Block which chooses a random number between 51.3 and 151.9, inclusively (i.e. 101.6 plus or minus 50.3), and delays the entering Transaction that amount of simulated time.

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SEIZE BLOCK

When the Active Transaction attempts to enter a SEIZE Block, it waits for or acquires ownership of a Facility Entity.

If the Facility is idle (not owned), the Transaction immediately acquires ownership of it, enters the SEIZE Block, and attempts to enter the next Block.

If the Facility is already owned, the transaction waits on the Delay Chain of the Facility and does not enter the SEIZE Block.

SIEZE JOE

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RELEASE BLOCK

A RELEASE Block releases ownership of a Facility.

RELEASE JOE

START BLOCK

The GPSS processor starts the simulation when it encounters a START block.

It uses the A operand on the START block as the initial value of the termination counter.

The TERMINATE block and START block are used in harmony to control the duration of the simulation run.

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TERMINATION BLOCK

A TERMINATE Block removes the Active Transaction from the simulation and optionally reduces the Termination Count.

```
TERMINATE 1

START     100
```

The Termination Count of the simulation, which is set by a START Command is decremented by 1.

Questions

- What are simulation languages? Explain any example using GPSS.
- Describe GPSS in detail and also state its important features.
- Explain in detail about block types and block symbols used in GPSS.
- What are the BLOCK ENTITYS? Explain BLOCK ENTITYS of GPSS in detail with their graphical representation.
- Give a detailed comparison of simulation packages with programming languages.