Question 2
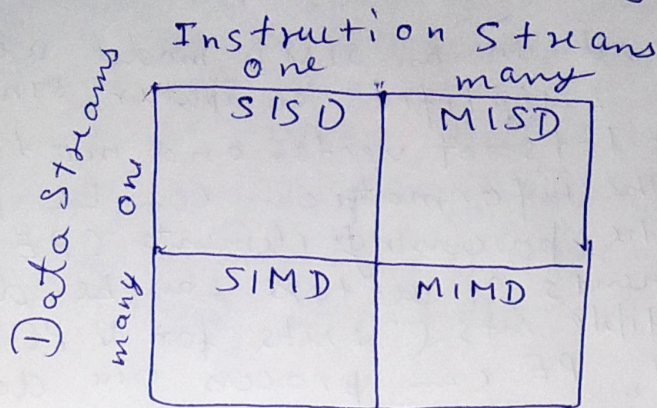
FLYNN'S TAXANOMY :-

=> It is based upon How the computer relates its
instructions to the data being processed : -
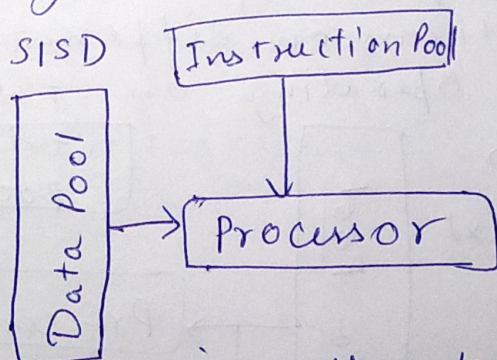
Instruction Streams

. Flynn's classification -

1). Single - instruction, Single data instruct systems (SISD :-

=> An SISD computer system is a uniprocessor machine
which is capable of executing a single instruction,
operating on the single data stream.

=> In SISD machine instructions are processed in a
sequential manner and computers adopting this
model are popularly called sequencial computers.

=> Most conventional computers have SISD
architecture. All the instructions and data
to be processed have to be stored in
primary memory.

SISD

The speed of the processing element in SISD model
is limited (dependent) by the rate at which
the computer can transfer information internally.

2) single-instruction, multiple-data (SIMD):-

⇒ An SIMD system is a multiprocessor machine capable of executing the same instruction on all the CPUs but operdrting on different data streams.

⇒ Machines based on an SIMD model are well suited to scientific computer since they involovee lots of vector ond matrix operations. so that the information can be passed to all the processing elements (PEs) organised data elements of vectors can be dividided into multiple sets (N sets for N PE systems) and each PE can process one data set.

SIMD

Instr Pool
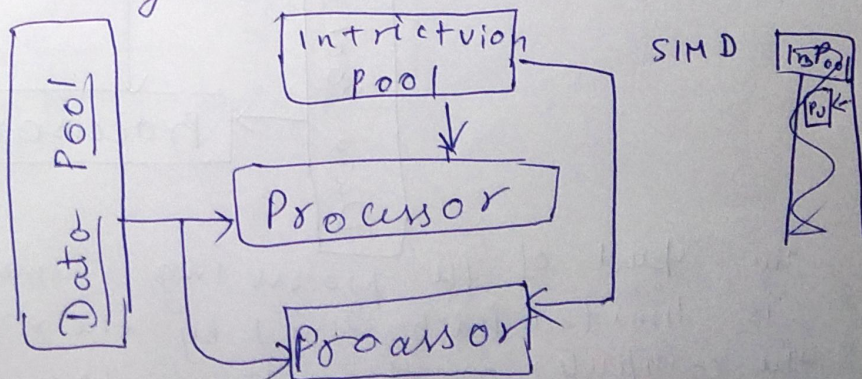
Data Pool

Processor
Processor
Processor
Processor
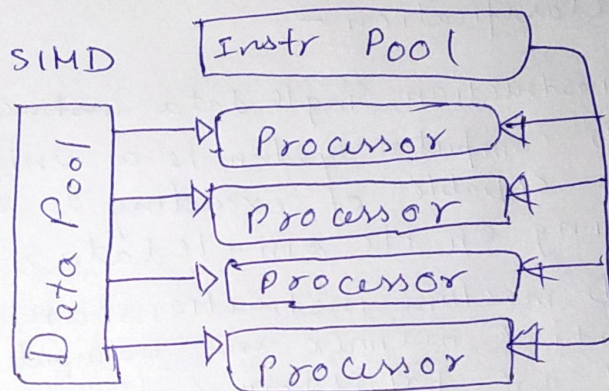
3) Multiple-instructions, single data (MISD)systens:

An MISD computer system is a multiprocessor machine capable of executing different instructions on different PE's but all of them operating on the same-datart.

Exbmple2=⇒

$\sin(x) + \cos(x) + \tan(x)$

Data Pool

Intrictvion Pool

Processor
Proassor

SIMD

In Pool

PU

4) Multiple-instruction, multiple data system :-

An MIMD system is a multiprocessor machine which is capable of executing multiple instructions on multiple data sets For PE in the MIMD Model has seprate instruction and data streams. therefore machines built using this model are capable to any kind of application.

Unlike SIMD and MISD machines, PEs in MIMD works asynchronously.

MIMD
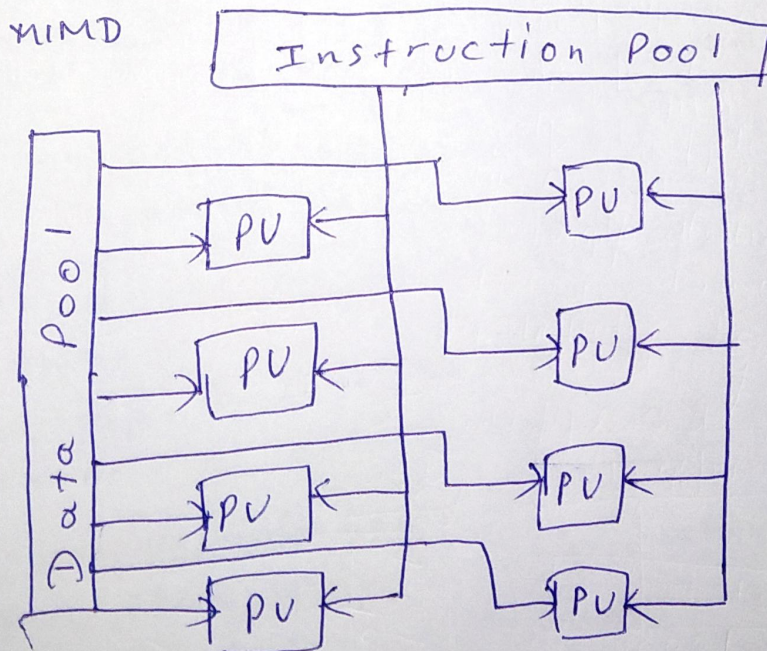
Ques 1

Cond^n of Parallelism

→ The ability to execute several program segments in parallel requires each segment to be independent of the other segments. We use a dependence graph to discribe the relations.

Data dependence :-

→ The ordering relationship between statements is indicated by the data dependence. Five type of data dependence are defined below

Flow dependence → A state S2 is flow dependent on S1 it an execution path exists from S1 to S2 and it at least one output of S1 feeds in S2 and it an input.

Anti " → statement S2 is anti dependent on the statement S1 it S2 follow S1 in the program order and it the o/p of S2 over laps the input $S_1 \rightarrow S_2$

O/P " → Two statements are o/p dependent it they produce the same o/p $S_1 \circ\!\!\rightarrow S_2$

I/O dependence → Read, write are I/o statements, I/O dependence occurs not because the same variable is involued →

Unknown " → The dependence relation b/w two statements conno t be determined. Eg → Indirect Addressing

control dependencies
→ This refers to the situation where the order of the expcution of statements can't be determined before run time.