Name : Rashik Rahman

ID : 17201012

1) a]

Pipeline is a performance improvement technique in which multiple instructions are overlaped in execution. Due to pipelining throughput is increased so it is very helpful for a set of instructions. It isn't that much helpful for a single instruction but if I consider a 1000 instructions pipelining will definetly help. It will reduce the total execution time, as due to it completing the instructions takes less clock cycles.

c]

Stages, k = 6

Time = 20 ns, 20ns, 30ns, 30ns, 20ns & 20ns.

non pipeline machine :

Instruction latency = 20+20+30+30+20+20

= 140ns

For 77 instructions = 140 × 77 = 10780 ns

Pipeline machine :

Instruction latency = maximum of all instruction's time

= 30ns

For 77 instructions = (30×6) + (30×76)

= 180 + 2280 = 2460 ns

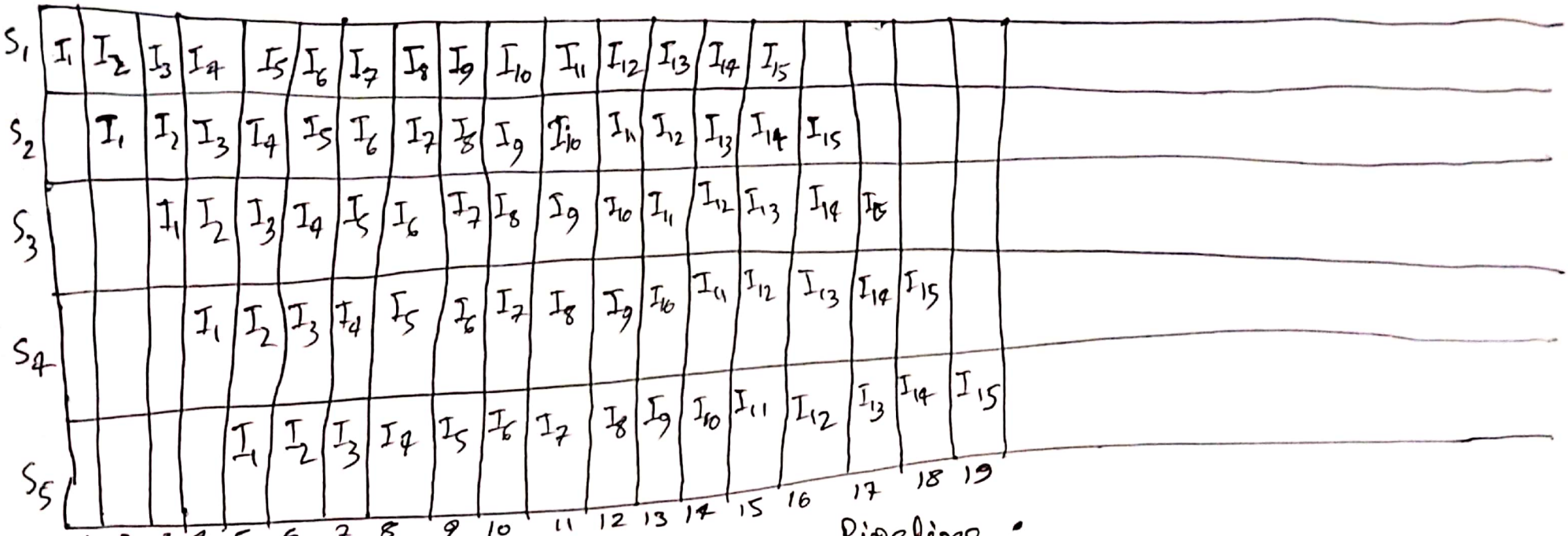
$$\text{Speedup} = \frac{\text{non-pipeline time}}{\text{pipeline time}}$$

$$= \frac{10780}{2460}$$

$$= 4.382 \text{ times}$$

P.T.O

6]



Non-pipeline:

clock cycle = 15 × 5 = 75 clock cycle

Pipeline :

clock cycle = $k + n - 1$ [k = no. of stages, n = no. of instruction]

= 5 + 15 − 1

= 19 clock cycle

$$\text{speedup} = \frac{75}{19} = 3.947$$

$$\text{utilization} = \frac{\text{use block}}{\text{Total block}}$$

$$= \frac{15 \times 5}{19 \times 5} = 0.7894$$

$$= 78.94\%$$