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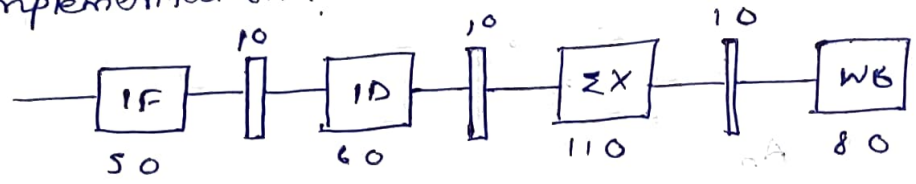
1. Consider a 4 stage pipeline that consists of IF, ID, EX and WB stages. The time taken by these stages are 50 ns, 60 ns, 110 ns and 80 ns respectively. The pipeline registers are required after every pipeline stage and each of these pipline registers consumes 10 ns delay. What is the speedup of the pipeline under ideal conditions compare to the corresponding non-pipelined implementation?

Ans



$$\text{Speed up} = \frac{\Sigma T_{\text{non-pipeline}}}{\Sigma T_{\text{pipeline}}} \Rightarrow S = \frac{t_n}{t_p}$$

$$t_n = (50 + 60 + 110 + 80)$$
$$= 300 \text{ ns}$$

$$t_p = \max^m(\text{stages delay}) + \text{register delay}$$

or, $t_p = \max^m(50, 60, 110, 80) + 10$

$= 110 + 10 = 120$ ns

$$\therefore S = \frac{300}{120} = 2.5$$

2. What is the difference between multiple processor, multi computer and multi core system?

Ans.

Multiprocessor	Multicomputer
① A system with two or more CPUs that allows simultaneous processing of programs	① A set of processors connected by the communication network that works jointly to solve a computation problem.
② Easier to process	② Less easy to program
③ More difficult and costly to build	③ Easier and cost effective to build.
④ Supports parallel computing	④ Supports distributed computing.

Multicore	Multiprocessor
① A single CPU or processor with two or more independant processing units called ~~cross~~ cores that are capable of reading and executing program instructions.	① A system with two or more CPUs that allows simultaneous processing of programs.
② Executes a single program faster.	② Executes multiple programs faster.
③ Not as reliable as a multi-processor	③ More reliable since failure in one CPU will not affect the other.
④ Have less traffic	④ Have more traffic.

3. A 30% enhancement in speedup for a component of the processor has been proposed for a new architecture. If the enhancement is usable only for 50% of the time, what is fraction of the time must enhancement be used to achieve an overall speedup of 10?

Ans: Say, the fraction of the time must ~~enchan~~ enhancement is used to achieve an overall speedup = X

So, $x \cdot \left(\frac{36}{56}\right) = 10$

or, $x = \frac{10 \times 5}{3}$

or, $x = \frac{50}{3}$

$\therefore x = 16.67$ (approx).