SPEED UP

$\psi(n,p) -$ *Speedup achieved for a problem size n using p processors*

$\sigma(n) -$ *Sequential portion*

$\varphi(n) -$ *Parallel portion*

$k(n,p) -$ *Sequential portion*

$$\psi(n,p) \leq \frac{\sigma(n)+\varphi(n)}{\sigma(n)+\frac{\varphi(n)}{p}+k(n,p)}$$

EFFICIENCY

$$Efficiency = \frac{Sequential\ Execution\ time}{Processors\ used \times parallel\ Execution\ time}$$

$$\epsilon(n,p) \leq \frac{\sigma(n)+\varphi(n)}{p\left(\sigma(n)+\frac{\varphi(n)}{p}+k(n,p)\right)}$$

$$\epsilon(n,p) \leq \frac{\sigma(n)+\varphi(n)}{(p\sigma(n)+\varphi(n)+pk(n,p))}$$

$\Rightarrow 0 \leq \epsilon(n,p) \leq 1$

AMDHAL'S LAW

$$\psi(n,p) \leq \frac{\sigma(n)+\varphi(n)}{\sigma(n)+\frac{\varphi(n)}{p}+k(n,p)}$$

As $k(n,p) > 0$

$$\psi(n,p) \leq \frac{\sigma(n)+\varphi(n)}{\sigma(n)+\frac{\varphi(n)}{p}}$$

By Definition ,

$$\boldsymbol{F = \frac{\sigma(n)}{\sigma(n)+\varphi(n)}\ (Sequential\ Fraction)}$$

So ,

$$\therefore\ \psi(n,p) \leq \frac{\sigma(n)+\varphi(n)}{\sigma(n)+\frac{\varphi(n)}{p}}$$

$$\psi(n,p) \leq \frac{\sigma(n)/_F}{\sigma(n)+\frac{\sigma(n)(1/_F-1)}{p}}$$

$$\psi(n,p) \leq \frac{1/_F}{1+\frac{(1/_F-1)}{p}}$$

$$\boldsymbol{\psi(n,p) \leq \frac{1}{F+(1-F)/p}}$$