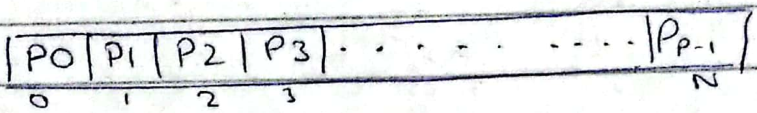
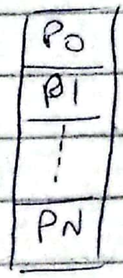
Assignment 2

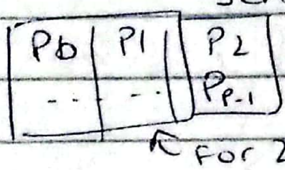
Parallel Distributed Computing
Name : Muhammad Hamza Khan
Roll : 21L-5654

Question 1:



1-D array block distribution scheme





← For 2D array block distribution

(a) The total number of tasks will be P i.e no. of processors because tasks ~~(or processes)~~ will be evenly distributed among processess

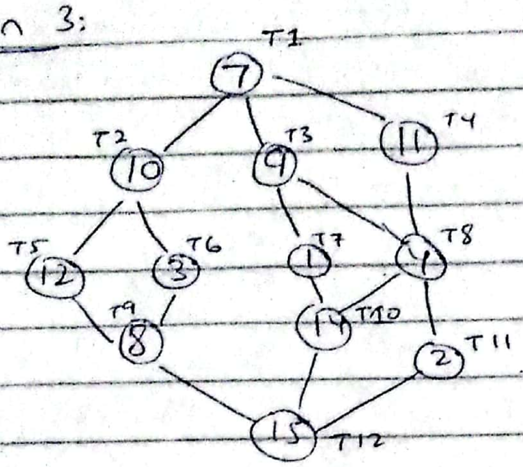
b) Block size can be calculated by n/p, ~~The~~ where 'n' is the total size of array and 'p' is the number of processes.

(c) If block number starts from zero, the (i)th block will be assigned to processes "$i \% P$" ~~P-1~~ in ~~(1-D)~~ array block distribution

(d) Starting index of block assigned to i(th) Process will be $i \% (N/P)$ for evenly distributed processes. N/p is block size.

(e) End index of block assigned to ith element process can be calculated as ~~(i+1)× N−1~~ $(i+1) \times BS - 1$ as starting element is at $i \% p$ index. Moreover, $BS = n/p$ and the start of indexing is from 0, so, we subtract 1.

Question 3:



1) Critical Path = $7 \rightarrow 10 \rightarrow 12 \rightarrow 8 \rightarrow 15$
$= T1 \rightarrow T2 \rightarrow T5 \rightarrow T9 \rightarrow T12$

2) Critical Path length = $7+10+12+8+15 = 52$.

3) Maximum achievable speedup:

Total amount of work = 96

Critical Path length = 52

So, max speedup over large no. of processes = $\frac{96}{52} = 1.846$

4) Minimum number of processes needed for max speedup:

$\Rightarrow$ max $\underset{1.84}{\underset{\downarrow}{\text{Speedup}}} = \frac{1}{96+\frac{52}{p}} \Rightarrow 1.84 = \frac{1}{96+\frac{52}{p}} \Rightarrow$ $1.84(96P+52)P$

$P = 175/95 = 0.5$

5) Maximum achievable speedup for processes limited to 4 =

$\cancel{\text{Speedup} = \frac{1}{96+\frac{52}{4}} = \frac{1}{96+13} = \frac{1}{99}}$

$$\text{Speedup} = \frac{1}{96+\frac{52}{4}} = \frac{1}{96+13} = \frac{1}{99}$$

$\frac{1}{99}$ would be max speedup for 4 processes.