

OS Numerical

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Q.7) Suppose, there are Six concurrent processes P_1, P_2, P_3, P_4, P_5 and P_6 arrive at time 0 with distinct burst time. These processes are going to be executed in a multiprocessing System where THREE processors are available with distinct speeds. The Scheduler used by the System is assumed to know the burst times of the processes beforehand. Each process will be assigned to a processor with the below given criteria:

- i. The fastest processor will be assigned with the process having the longest burst time
 - ii. The Slowest processor will be assigned with the process having the shortest burst time
 - iii. Each processor will be assigned with at least one process
- Then, compute the different number of ways that the assignment can be performed.

Here it is given that it is a multiprocessing System with three processors with different Speed.

Let the processors be C_1, C_2, C_3

Given that the fastest processors is assigned to longest burst time Process and the slowest processor is assigned to shortest burst time

Assuming, P_1 ~~is~~ assigned to C_1 and P_6 assigned to C_3

Let C_1 ~~be~~ the fastest and C_3 ~~be~~ the slowest processor

Let P_1 ~~be~~ the Process having the longest burst time and P_6 with shortest

After assigning we are left with other four Processes and one processor

C_2 be the medium processor, to be assigning one process to C_2

two processes to C_2 , three processes to C_2 and four processes to C_2

one process to C_2 processor

We can assign 1 out of 4 processes in $4C_1$ ways and

remaining 3 processes to C_1, C_3 in $2 \times 2 \times 2 = 8$ ways

Assigning two processes to C_2 processor

We can assign 2 out of 4 processes in $4C_2$ ways and

remaining 2 can be assigned to $C_1 \& C_3$ in $2 \times 2 = 4$ ways

Assigning three processes to C_2 processor

We can assign 3 out of 4 processes in $4C_3$ ways and

remaining can be assigned to $C_1 \& C_3$ in 2 ways

Assigning four processes to C_2 processor

We can assign in only one way.

Therefore,

$$\begin{aligned}
 \text{The total is: } & {}^4C_1 * 2^3 + {}^4C_2 * 2^2 + {}^4C_1 * 2 + 1 \\
 &= {}^4C_1 * 8 + {}^4C_2 * 4 + {}^4C_1 * 2 + 1 \\
 &= 32 + 24 + 8 + 1 \\
 &= 65
 \end{aligned}$$

∴ The different number of ways that the assignment can be performed is 65

Another Method:

After assigning C_1 and C_3 , we remain with 4 processes remaining 4 processes can go to any processor, But processor C_2 must get at least one process.

Total ways, $3^4 = 81$.

Every processor gets at least one process then we have to subtract the given criteria where C_2 has not yet assigned, after assigning C_1 and C_3

we get 2^4 , where C_2 not assigned with any processor.

Therefore, The total number of ways that the assignment can be performed is, $81 - 2^4 \Rightarrow 81 - 16 = 65$ ways