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Process Scheduling

1- Scheduling can be defined as a set of policies and mechanisms which controls the order in which the work to be done is completed.
The scheduling program which is a system software concerned with scheduling is called the scheduler and the algorithm it uses is called the scheduling algorithm.
- The criteria that should be considered with the scheduling algorithms:
  - CPU utilization
  - Throughput
  - Turnaround
  - Waiting time
  - Response

2- Definition of scheduling algorithms criteria:

A- Throughput : it's the amount of work completed in a unit of time.
- it's the processes executed to number of jobs completed in a unit of time.

B- Turnaround time : it refers to the time between the moment of submission of a job / process and the time of it's completion. Thus how long it takes to execute a process is also an important factor.

2- Count :

C- Waiting Time : IT's The Time a Job waits For resource allocation when several jobs are competing in multiprogramming system. The aim is To minimize The waiting Time.

D- Response Time : IT's The Time Taken To start responding To The request. A scheduler must aim To minimize response Time For interactive users

3- The objectives of Process scheduling algorithm:

- Max CPU utilization (Keep CPU as busy as Possible)
- Fair allocation of CPU.
- Max Throughput (Number of Processes That Complete Their execution per Time unit)
- Min Turnaround Time (Time Taken by a Process To Finish execution).
- Min Waiting Time (Time a Process waits in ready queue).
- Min response Time (Time When a Process produces First response).

4- The objectives of multiprogramming:

- Minimising unused CPU Time.
- Reduce incidence of Peripheral-bound operations.
- Minimising Total elapsed Time.
- Preventing single programs From dominating The CPU.

5- The Prime aim of The Process Scheduling system is To keep The CPU busy all The Time and To deliver minimum response Time for all programs.

6- • When an interrupt occurs, The system needs To save The current context of The process currently running of The CPU so That it can restore That context when it's processing is done. The context is represented in The PCB of The process.

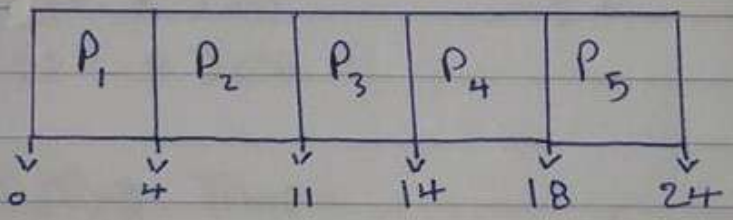
- Switching The CPU To another process requires performing a state save of The current process and a state restore of a different process. This Task is known as a "context switching".
- When a context switch occurs, The kernel saves The context of The old process in it's PCB and loads The saved context of The new process scheduled To run.

7.

Process	Burst Time	Arrival Time	Priority
P_1	4	0	3
P_2	7	3	1
P_3	3	5	4
P_4	4	7	5
P_5	6	8	2

a) GanTT Chart:

- FCFS



b) Turnaround:

P_1 (4 - 0) = 4
P_2 (11 - 3) = 8
P_3 (14 - 5) = 9
P_4 (18 - 7) = 11
P_5 (24 - 8) = 16

AVG Turnaround $= \frac{4+8+9+11+16}{5}$

$= 9.6$

c) Waiting Time:

P_1 (0 - 0) = 0
P_2 (4 - 3) = 1
P_3 (11 - 5) = 6
P_4 (14 - 7) = 7
P_5 (18 - 8) = 10

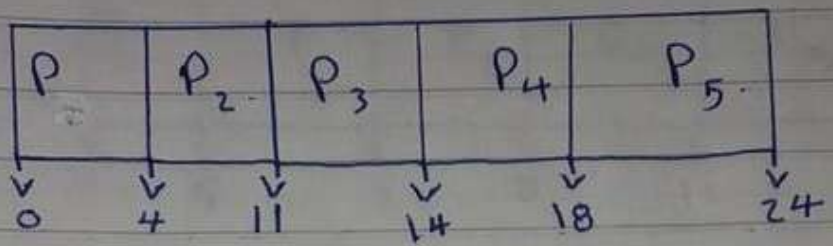
AVG Waiting Time $= \frac{0+1+6+7+10}{5}$

$= 4.8$

Q5

a) Gant Chart

- SJF



b) Turnaround:

P_1 (4-0) = 4
P_2 (11-3) = 8
P_3 (14-5) = 9
P_4 (18-7) = 11
P_5 (24-8) = 16

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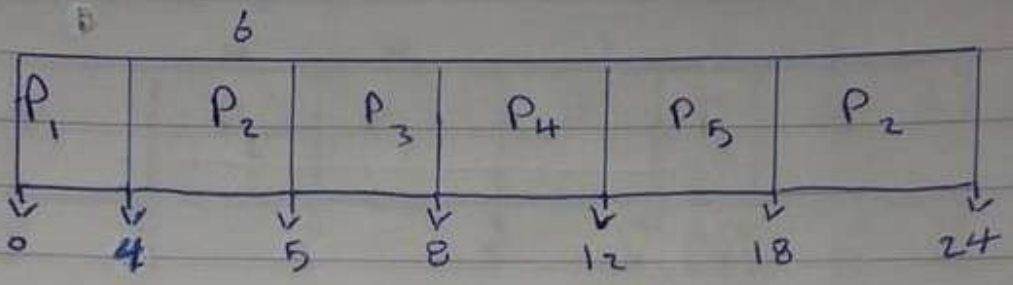
P_5 (18-8) = 10

AVG $= \frac{0+1+6+7+10}{5}$

$= 4.8$

Q1

a) Gant Chart
SRT



b) Turnaround

P_1 (4 - 0) = 4

P_2 (5 - 3) + (24 - 4) = 22

P_3 (8 - 5) = 3

P_4 (12 - 7) = 5

P_5 (18 - 8) = 10

AVG

$\frac{4 + 22 + 3 + 5 + 10}{5}$

= 8.8

c) Waiting Time

P_1 (0 - 0) = 0

P_2 (4 - 3) + (18 - 5) = 14

P_3 (5 - 5) = 0

P_4 (8 - 7) = 1

P_5 (12 - 8) = 4

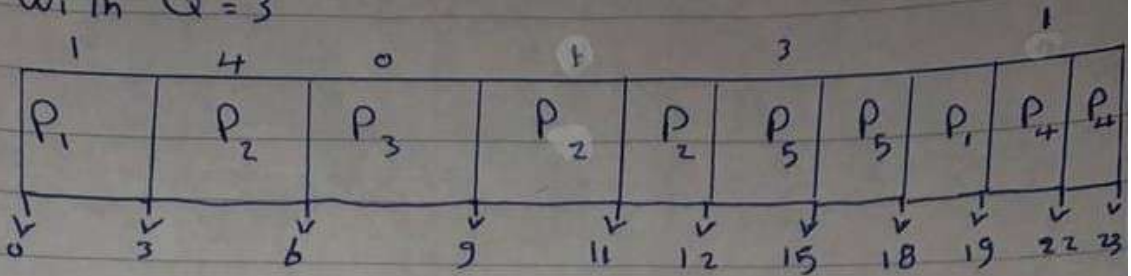
AVG

$\frac{0 + 14 + 0 + 1 + 4}{5}$

= 3.8

[7]

a) Gant Chart
RR with Q = 3



b) Turnaround

$P_1 (3-0) + (19-0) = 22$
$P_2 (6-3) + (12-3) = 12$
$P_3 (9-5) = 4$
$P_4 (23-7) = 16$
$P_5 (18-8) = 10$

AVG
$\frac{22+12+4+16+10}{5}$
$= 12.8$

c) Waiting Time

$P_1 (0-0) + (18-3) = 15$
$P_2 (3-3) + (9-6) = 3$
$P_3 (6-5) = 1$
$P_4 (19-7) = 12$
$P_5 (12-8) = 4$

AVG
$\frac{15+3+1+12+4}{5}$
$= 7$

#D The minimum Average Waiting Time (over all Processes)

SRT → AVG waiting Time
$= 3.8$