COMPUTER SCIENCE & I.T

OPERATING SYSTEMS

Process Synchronization/ Coordination 01

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TOPICS COVERED

1. IPC & Synchronization
2. Types of Synchronization

Q.11

Consider a System using Round Robin Scheduling with 10 Processes all arriving at the time 0. Each Process is associated with 20 identical Request. Each Process request consumes 20 ms of CPU time after which it spends 10 ms of time on I/O, thereafter, initiates subsequent Request. Assuming Scheduling Overhead of 2 ms and Time Quantum of 20 ms, Calculate

i. Response time of the 1st request of the 1st Process
ii. Response time of the 1st request of the last Process
iii. Response time of the subsequent request of any Process.

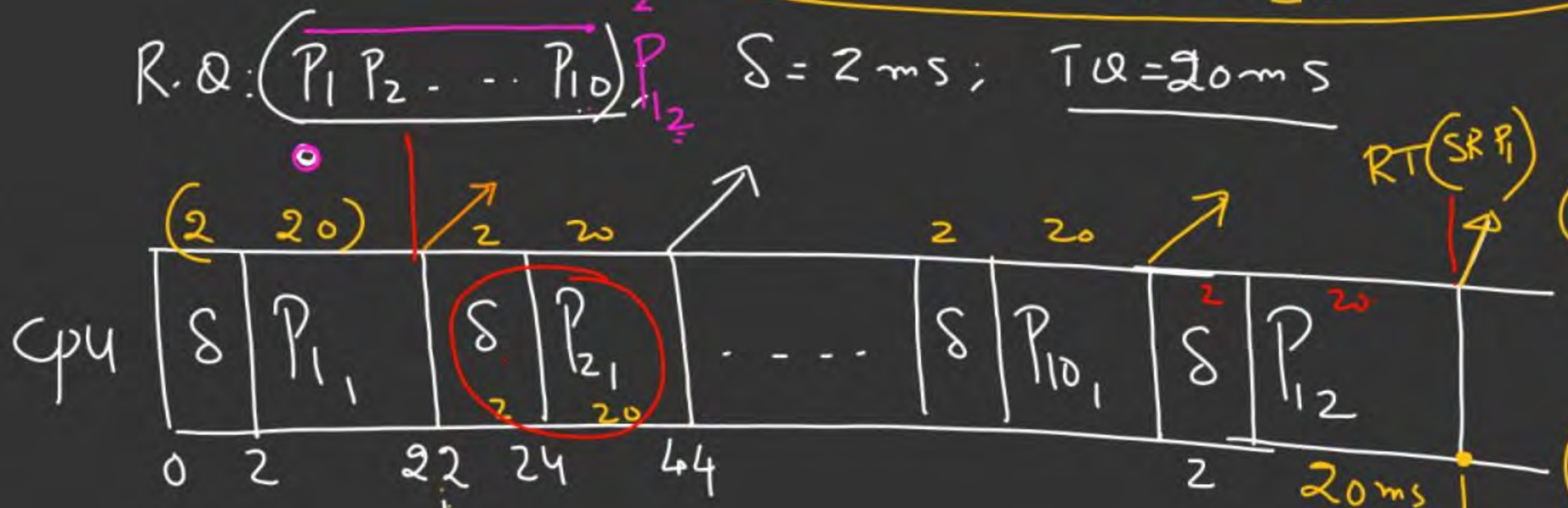
Assignment: Repeat the Problem if TQ = 10ms

Lifecycle of P_i : 20ms of CPU time to generate response

10 ms IO

1st cycle.

R.Q: $P_1\ P_2 \ldots P_{10}\ P_{12}$ $\quad S = 2ms;\ TQ = 20ms$



(i) 22 ms

(ii) $R.T(P_{10_1}) = 220_{ms}$

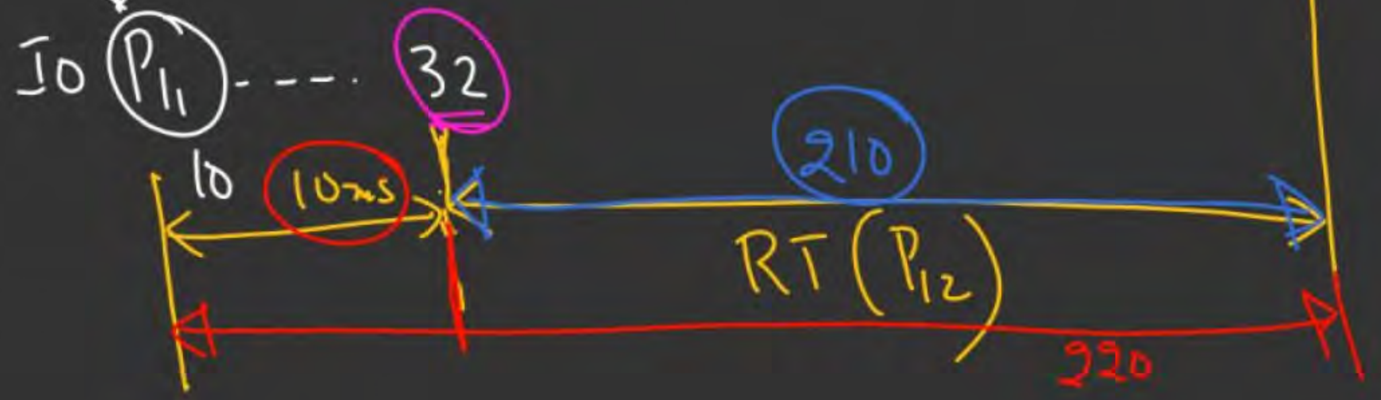
(2+20) 10

(iii) $R.T(SR_i)$ =

C

2m

210 ms



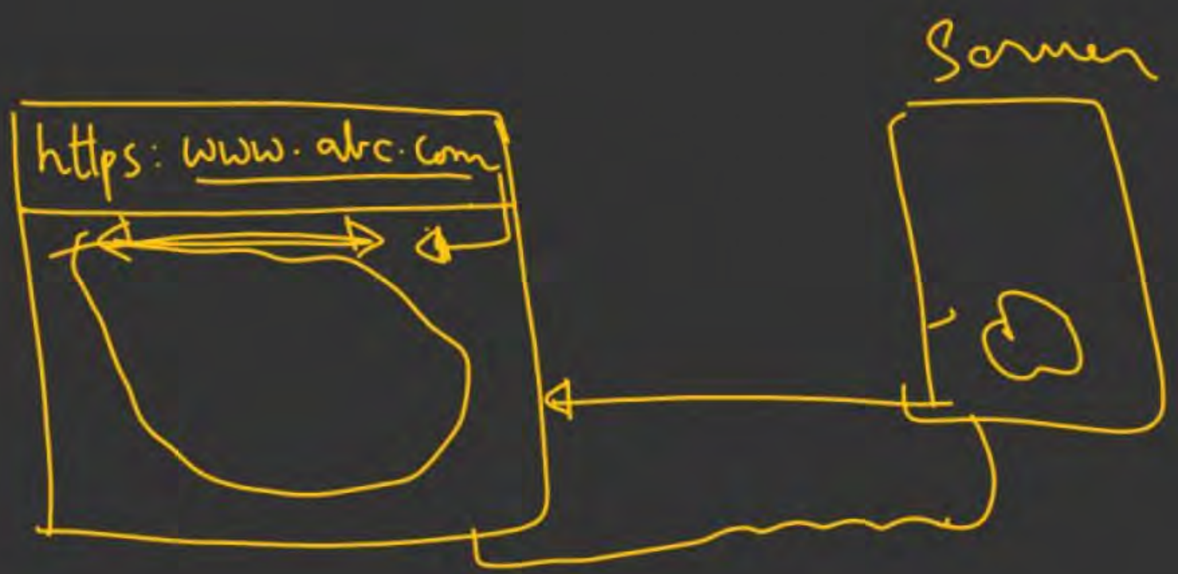
Response Time: The time at which the request is submitted by the process, to the time at which it generates the response (Initial results);

Scenario - 1

class

Scenario:

Browser



Q.12

H/W

Consider a System using RR Scheduling with TQ of 'Q' seconds & CPU Scheduling overhead is 'S' seconds. Each Process on an average run for 'T' seconds before blocking on I/O. Give a formula for CPU efficiency for each of the following conditions.

1. $Q = \infty$
2. $Q > T$
3. $S < Q < T$
4. $Q = S$
5. $Q \approx 0$

Q.13

H/W

Consider a System using Preemptive Priority based scheduling with dynamically changing priorities. On its arrival a Process is assigned a priority of zero and Running Process Priority increases at the rate of ' β ' and Priority of the Processes in the ready Q increases at the rate of ' α '. By dynamically changing the values of α and β one can achieve different Scheduling disciplines among the Processes. What discipline will be followed for the following conditions.

1. $\beta > \alpha > 0$
2. $\alpha < \beta < 0$

Q.14

H/W

Consider a System using Preemptive Priority based scheduling with dynamically changing priorities. On its arrival a Process is assigned a priority of zero and Running Process Priority increases at the rate of ' β ' and Priority of the Processes in the ready Q increases at the rate of ' α '. By dynamically changing the values of α and β one can achieve different Scheduling disciplines among the Processes. What discipline will be followed for the following conditions.

1. $\beta > \alpha > 0$
2. $\alpha < \beta < 0$

Q.15 Consider Processes P_1 &P_2 arriving in the ready queue at time 0 with following properties.

Challenge H/W

i) P1 needs a total of 12 units of CPU time and 20 units of I/O time. After every 3 units of CPU time $P1$ spends 5 units on I/O.

ii) $P2$ needs a total of 15 units of CPU time and no L/O. P2 arrives just after P1.

Compute the Completion times of P_1 &P_2 using the following scheduling techniques:

1.SRTF

2.Round Robin with Time Quanta = 4 units

Q.16

Three processes A, B and C each execute a loop of 100 iterations. In each iteration of the loop, a process performs a single computation that requires tc CPU milliseconds and then initiates a single I/O operation that lasts for t_{io} milliseconds. It is assumed that the computer where the processes execute has sufficient number of I/O devices and the OS of the computer assigns different I/O devices to each process. Also the scheduling overhead of the OS is negligible. The processes have the following characteristics:

G → H/W

Process Id	t_c	t_{io}
A	100 ms	500 ms
B	350 ms	500 ms
C	200 ms	500 ms

The processes A, B, and C are started at times 0,5 and 10 milliseconds respectively in a pure time-sharing system (round robin scheduling) that uses a time slice of 50 milliseconds. The time in milliseconds at which process C would complete its first I/O operation is

Q.17 Which of the following statements (s) is/are correct in the context of CPU Scheduling?

G22 MSQ

A. The goal is to only maximize CPU utilization and minimize throughput

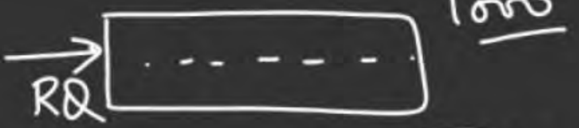
B. Turnaround time includes waiting time

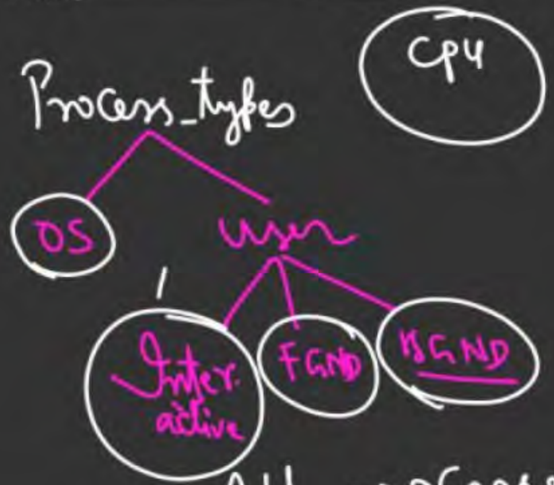
C. Implementing preemptive scheduling needs hardware support

D. Round-robin policy can be used even when the CPU time required by each of the processes is not known Apriori.

8) Multi-Level Queue Scheduling

Single Ready 'Q'



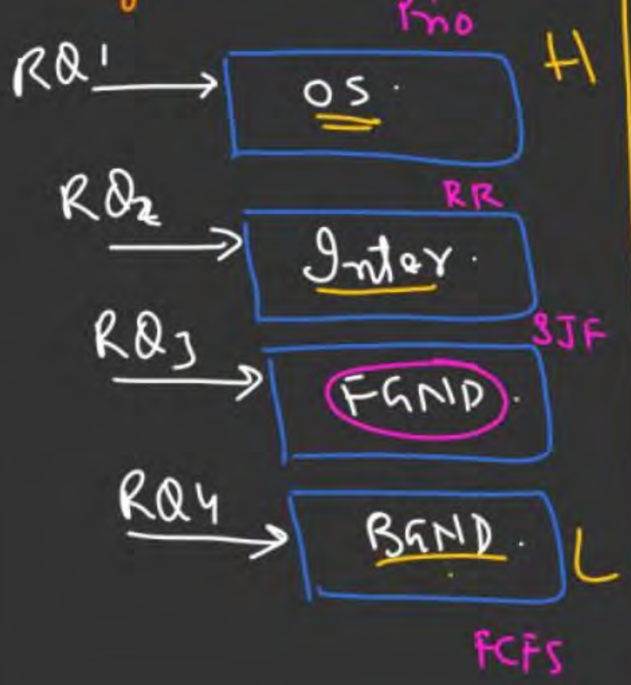


→ All processes will have to use only one Scheduling technique

→ a lot of Searching Time;

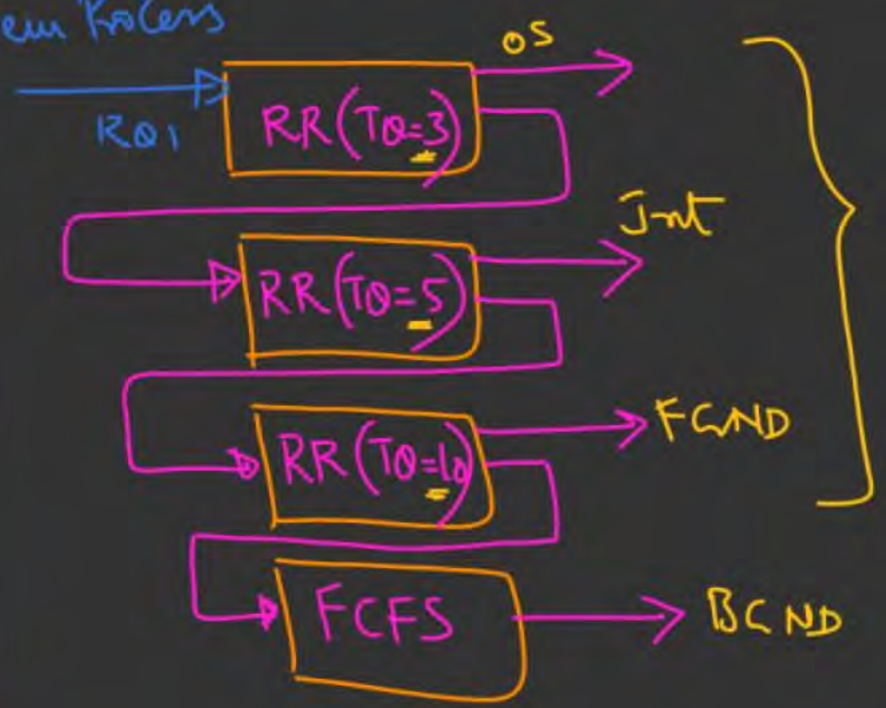
Soln:

Multi-Level 'Q' System



Starvation: Processes in Lower Q's (having lesser Priority)

Multi-Level Feedback Q




THANK
YOU!