class test : 1 3 2

1)

	AT	BT	CT	TAT	WT
P_1	0	8	8	8	0
P_2	1	4	15	14	10
P_3	2	2	11	9	7
P_4	3	1	9	6	5

Gantt Chart

P_1	P_4	P_3	P_4
0	8	9	11	15

Average TAT

$8 + 14 + 9 + 6 = 37$

$\frac{37}{4} = 9.25$ sec

Average WT (Waiting time)

$0 + 10 + 7 + 5 = \frac{22}{4} = 5.5$ sec

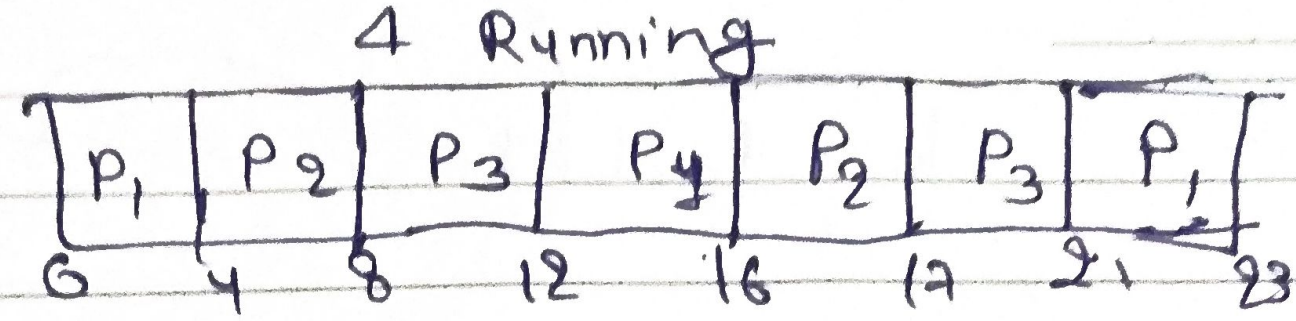
2)

	AT	BT	CT	TAT	WT
P_1	0	~~16~~ 8 2	23	23	13
P_2	1	~~5~~ 1	17	16	11
P_3	2	~~8~~ 4	21	19	11

Gantt chart Ready

P_1	P_2	P_3	P_1	P_2	P_3	P_1

TQ = 4 unit



Average waiting time :—

$13 + 11 + 11 = 35$

$\frac{35}{3} = 11.66$ Solo

4) (MLTQ) Multileved tra back queue

→ Scheduling Model MLFQ uses multiple queue with different properties

→ The top queue has the highest priority & smallest time quantum

→ Lower queue have longer time quatum (or even FCFS)

→ A process starts in the top queue

* if it starts in the top queue in quantum

* if it waits too long, it maybe promoted up b gain)

example)

Q_1 :- RR, TQ = 4ms
Q_2 : RR, TQ = 8 ms
Q_3 : FCFS, TQ = nil

Q_1 : Diagram

Quantum = 4ms, higher priority, Q_1

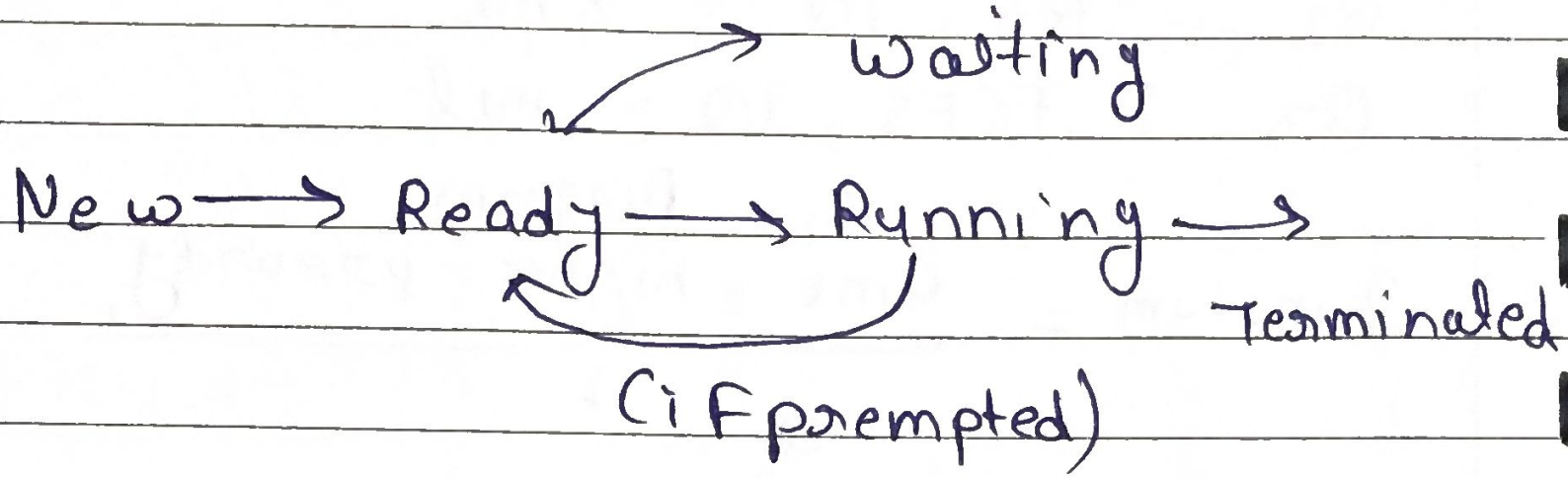
Quantum = 8ms, medium priority, Q_2

Quantum = nil, Q_3, lowest priority

proasse more downward if they use too much CPU and can be promoted up if they wait too long, aging

5) Main states
1. New - process is created
2. Ready - waiting is Ready queue
3. Running - being executed by CPU
4. waiting / Blocked - waiting for I/o event
5. fundamental - finished execution

Diagram -



Example

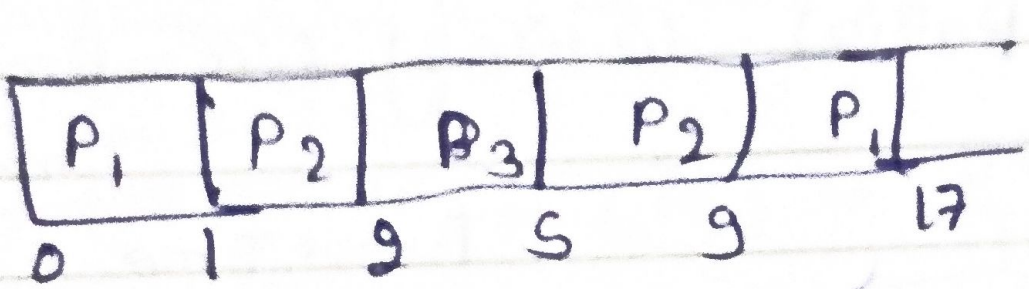
- New → Ready : Process admitted to memory
- Ready → Running : Schedule dispached it to CPU.
- Running → waeting : Request I/O (e.g. disk read)
- Waeted → Ready : I/O completed
- Running → Ready : Prempted by Schedwler (Time quatum expired)

* Running - terminated : Process finishes execution

Q6 -

	AT	BT	CT	TAT	WT
P_1	0	8	17	17	9
P_2	1	4	9	8	3
P_3	2	3	5	3	0

Gantt chart



Average TAT = TAT / 3

$17 + 8 + 9 = 28/3 = 9.\overline{33}$ sec

Average WT = WT / 3

$9 + 3 + 0 = 12/3 = 3.\overline{66}$ sec

Section C

a) Turn around time

TAT = Completion Time − Arrival Time

b) Waiting time :
WT = TAT - Burst time

c) Response Time :
RT = First Response time - arrival time

d) HRRN (Highest Response Ratio next
Response Ratio : Waiting time + Burst Time
Burst Time

e) Average throughput if 4 jobs completed in 20 ms
Throughput = No. of process complete / total time

3)

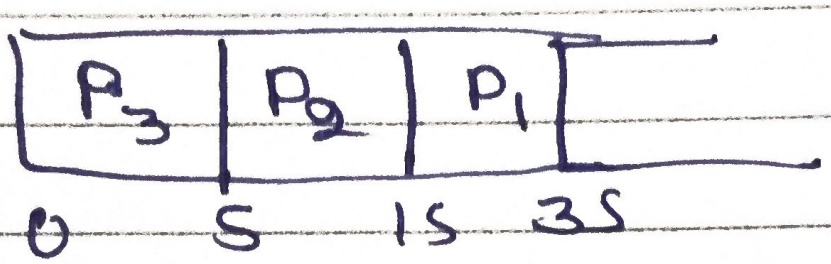
HRRN	BT	AT	CT	TAT	WT
P_1	20	0	35	35	15
P_2	10	0	15	15	5
P_3	5	0	5	5	0

As all jobs arrive at 0 hence the waiting time for all is 0 So

$$HRRN = \frac{WT + BT}{BT}$$

$$= \frac{0+20}{20} = 1 \text{ for ALL}$$

So let's start with P_3 (0 - 5)



Now HRRN $(P_2) = \frac{10+5}{10} = 1.5$

HRRN $(P_3) = \frac{20+5}{20} = \frac{25}{20} = 1.25$

HRRN $(P_1) <$ HRRN (P_2)

Hence P_2 will be executed first

Average TAT $= \frac{55}{3} = 18.33$ ms

Average WT $= \frac{20}{3} = 6.67$ ms

∴