DIGITAL ASSIGNMENT 1

Name – Kamran Ansari

Reg No – 22MCA0223

Q.1. Consider the following processes with CPU burst time as

Process	Burst time	Priority
P1	4	2
P2	2	1
P3	8	3
P4	2	4
P5	5	2

All process arrive in order P1, P2, P3, P4, P5 at time 0s.
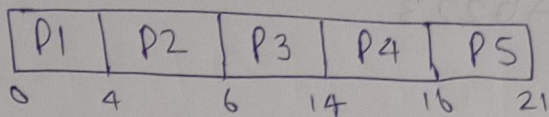
Draw Grantt charts to show execution using FCFS, STF, Priority and RR(Quantum = 2ms)

Also calculate avg Waiting Time and Turnaround time for each.

Ans. First Come First Serve (FCFS)

Gantt Chart

P1	P2	P3	P4	P5
0	4	6	14	16	21

Process Id	Completion Time (ms)	Turnaround Time (ms)	Waiting Time (ms)
P1	4	4	0
P2	6	6	4
P3	14	14	6
P4	16	16	14
P5	21	21	16

$$\text{Average Turnaround Time} = \frac{4+6+14+16+21}{5}$$

$$= 12.2 \text{ ms}$$

$$\text{Average Waiting Time} = \frac{0+4+6+14+16}{5}$$

$$= 8 \text{ ms}$$

Shortest Job First (SJF)

Gantt Chart

P_2	P_4	P_1	P_5	P_3
0 2	4	8	13	21

Process Id	Completion Time (ms)	Turnaround Time (ms)	Waiting Time (ms)
P1	8	8	4
P2	2	2	0
P3	21	21	13
P4	4	4	2
P5	13	13	8

$$\text{Average Turnaround Time} = \frac{8 + 2 + 21 + 4 + 13}{5}$$

$$= 9.6 \text{ ms}$$

$$\text{Average Waiting Time} = \frac{4 + 0 + 13 + 2 + 8}{5}$$

$$= 5.4 \text{ ms}$$

Priority

Gantt Chart

P2	P1	P5	P3	P4
0	2	6	11	19	21
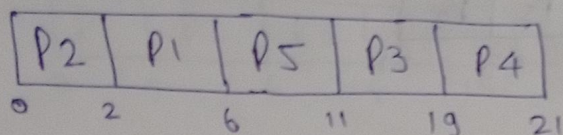
Process Id	Completion Time (ms)	Turnaround Time (ms)	Waiting Time (ms)
P1	6	6	2
P2	2	2	0
P3	19	19	11
P4	21	21	19
P5	11	11	6

Average Turnaround Time $= \dfrac{6 + 2 + 19 + 21 + 11}{5}$

$= 11.8\ ms$

Average Waiting Time $= \dfrac{2 + 0 + 11 + 19 + 6}{5}$

$= 7.6\ ms$

Round Robin (RR)

Quantum = 2ms

PID	R1	R2	R3	R4
P1	2(2)	2(0)	—	—
P2	2(0)	—	—	—
P3	2(6)	2(4)	2(2)	2(0)
P4	2(0)	—	—	—
P5	2(3)	2(1)	1(0)	—

Gantt chart

P1	P2	P3	P4	P5	P1	P3	P5	P3	P5	P3

0   2   4   6   8   10   12   14   16   18   19   21

Process Id	Completion Time (ms)	Turnaround Time (ms)	Waiting Time (ms)
P1	12	12	8
P2	4	4	2
P3	21	21	13
P4	8	8	6

P5	19	19	14

Average Turnaround = $\dfrac{12 + 4 + 21 + 8 + 19}{5}$
Time

$$= 12.8 \text{ ms}$$

Average Waiting = $\dfrac{8 + 2 + 13 + 6 + 14}{5}$
Time

$$= 8.6 \text{ ms}$$

Comparison

Algorithm	Average TAT (ms)	Average WT (ms)
FCFS	12.2	8
SJF	9.6	5.4
Priority	11.8	7.6
RR	12.8	8.6

SJF is best suited in this example.

Q.2. Consider process given below

Process	Arrival Time	Burst Time
P1	0	12
P2	1	8
P3	2	10
P4	3	4

Draw Gantt Chart, demonstrating FCFS, SRT and RR (Q = 2 ms). Also calculate avg waiting time and turnaround time for each.

Ans. First Come First Serve (FCFS)

Gantt Chart

P1	P2	P3	P4

0   12   20   30   34
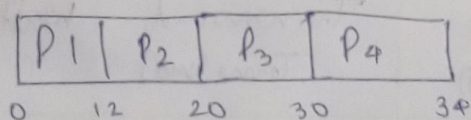
Process Id	Completion Time (ms)	Turnaround Time (ms)	Waiting Time (ms)
P1	12	12	0
P2	20	19	11
P3	30	28	18

P4	34	31	27

Average Turnaround Time $= \dfrac{12+19+28+31}{4}$

$$= 22.5 \text{ ms}$$

Average Waiting Time $= \dfrac{0+11+18+27}{4}$

$$= 14 \text{ ms}$$

Shortest Remaining Time First (SRTF)

Grantt Chart

P1	P2	P4	P2	P3	P1

0   1   3   7   13   23   34
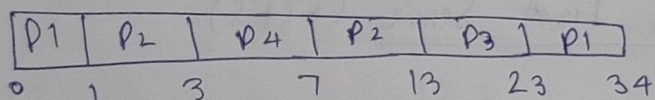
Process Id	Completion Time (ms)	Turnaround Time (ms)	Waiting Time (ms)
P1	34	34	22
P2	13	12	4
P3	23	21	11
P4	7	4	0

$$\text{Average Turnaround} = \frac{34+12+21+4}{4}$$
$$\text{Time}$$
$$= 17.75 \text{ ms}$$

$$\text{Average Waiting} = \frac{22+4+11+0}{4}$$
$$\text{Time}$$
$$= 9.25 \text{ ms}$$

Round Robin (RR)

PID	R1	R2	R3	R4	R5	R6
P1	2(10)	2(8)	2(6)	2(4)	2(2)	2(0)
P2	2(6)	2(4)	2(2)	2(0)	—	—
P3	2(8)	2(6)	2(4)	2(2)	2(0)	—
P4	2(2)	2(0)	? —	—	—	—

Gantt Chart

P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P1	P2	P3	P1	P3	P1

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34

Process Id	Completion Time (ms)	Turnaround Time (ms)	Waiting Time (ms)
P1	34	34	22
P2	26	25	17
P3	32	30	20
P4	16	13	9

Average Turnaround Time $= \dfrac{34 + 25 + 30 + 13}{4}$

$= 25.5$ ms

Average Waiting Time $= \dfrac{22 + 17 + 20 + 9}{4}$

$= 17$ ms

Comparison

Algorithm	Average TAT (ms)	Average WT (ms)
FCFS	22.5	14
SRTF	17.75	9.25
RR	25.5	17

SRTF is best suited in this example.