

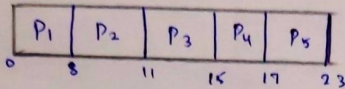
OPERATING SYSTEM ASSIGNMENT-1

①

Process	Burst time	Priority	AT
P ₁	8	3	0
P ₂	3	1	0
P ₃	4	4	0
P ₄	2	2	0
P ₅	6	5	0

FCFS:

Grant chart:



Waiting time: (st - AT)

P₁ = 0 - 0 = 0 Average waiting time

P₂ = 8 - 0 = 8 = $\frac{0+8+11+15+17}{5}$

P₃ = 11 - 0 = 11 = $\frac{51}{5}$

P₄ = 15 - 0 = 15 = $\frac{51}{5} = 10.2 \text{ ms}$

P₅ = 17 - 0 = 17

Turn around time: (CT - AT)

P₁ = 8 - 0 = 8

P₂ = 11 - 0 = 11

P₃ = 15 - 0 = 15

P₄ = 17 - 0 = 17

P₅ = 23 - 0 = 23

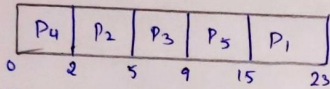
Avg TAT:

$$= \frac{8+11+15+17+23}{5} = \frac{74}{5}$$

$$= 14.8 \text{ ms}$$

SJF:

Grant chart:



Waiting time: (st - AT)

P₁ = 15 - 0 = 15

P₂ = 2 - 0 = 2

P₃ = 5 - 0 = 5

P₄ = 0 - 0 = 0

P₅ = 9 - 0 = 9

Avg WT:

$$= \frac{15+2+5+0+9}{5}$$

$$= \frac{31}{5} = 6.2 \text{ ms}$$

Turn around time: (CT - AT)

P₁ = 23 - 0

P₂ = 5 - 0

P₃ = 9 - 0

P₄ = 2 - 0

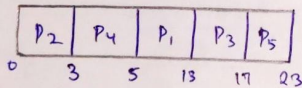
P₅ = 15 - 0

$$\frac{23+5+9+2+15}{5} = \frac{54}{5}$$

$$= 10.8 \text{ ms}$$

Priority:

Grant chart:



Waiting time: (st - AT)

P₁ = 5 - 0 = 5

P₂ = 0 - 0 = 0

P₃ = 13 - 0 = 13

P₄ = 3 - 0 = 3

P₅ = 17 - 0 = 17

Avg WT:

$$= \frac{5+0+13+3+17}{5}$$

$$= \frac{38}{5} = 7.6 \text{ ms}$$

Turn around time: (CT - AT)

P₁ = 13 - 0 = 13

P₂ = 3 - 0 = 3

P₃ = 17 - 0 = 17

P₄ = 5 - 0 = 5

P₅ = 23 - 0 = 23

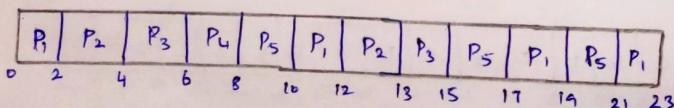
Avg (TAT):

$$\frac{13+3+17+5+23}{5}$$

$$= \frac{61}{5} = 12.2 \text{ ms}$$

Round Robin:

Grant chart:



waiting time: (ST-AT)

$$P_1 = (0-0) + (10-2) + (17-12) + (21-19) = 15$$

$$P_2 = (2-0) + (12-4) = 10$$

$$P_3 = (4-0) + (13-6) = 11$$

$$P_4 = (6-0) = 6$$

$$P_5 = (8-0) + (15-10) + (19-17) = 9$$

Avg WT:

$$\frac{15 + 10 + 11 + 6 + 9}{5} = \frac{51}{5}$$

$$= \boxed{10.2 \text{ ms}}$$

Turn around: (CT-AT)

$$P_1 = 23-0 = 23$$

$$P_2 = 13-0 = 13$$

$$P_3 = 15-0 = 15$$

$$P_4 = 8-0 = 8$$

$$P_5 = 21-0 = 21$$

Avg TAT:

$$\frac{23 + 13 + 15 + 8 + 21}{5}$$

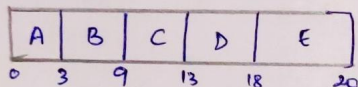
$$= \frac{80}{5} = \boxed{16 \text{ ms}}$$

(2)

Process	A.T	B.T
A	0	3
B	2	6
C	4	4
D	6	5
E	8	2

FCFS:

Gantt chart:



waiting time: (ST-AT)

$$A = 0-0 = 0$$

$$B = 3-2 = 1$$

$$C = 9-4 = 5$$

$$D = 13-6 = 7$$

$$E = 18-8 = 10$$

Avg WT:

$$\frac{0 + 1 + 5 + 7 + 10}{5}$$

$$= \frac{23}{5} = \boxed{4.6 \text{ ms}}$$

Turn around time: (CT-AT)

$$A = 3-0 = 3$$

$$B = 9-2 = 7$$

$$C = 13-4 = 9$$

$$D = 18-6 = 12$$

$$E = 20-8 = 12$$

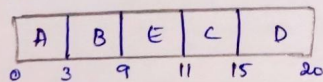
Avg TAT:

$$\frac{3 + 7 + 9 + 12 + 12}{5} = \frac{43}{5}$$

$$= \boxed{8.6 \text{ ms}}$$

SJF: (non-pre-emptive)

Gantt chart:



waiting time: (ST-AT)

$$A = 0-0 = 0$$

$$B = 3-2 = 1$$

$$C = 9-8 = 1$$

$$D = 11-4 = 7$$

$$E = 15-8 = 7$$

Avg WT:

$$\frac{0 + 1 + 1 + 7 + 7}{5}$$

$$= \frac{16}{5} = \boxed{3.2 \text{ ms}}$$

Turn around time: (CT-AT)

$$A = 3-0 = 3$$

$$B = 9-2 = 7$$

$$C = 11-8 = 3$$

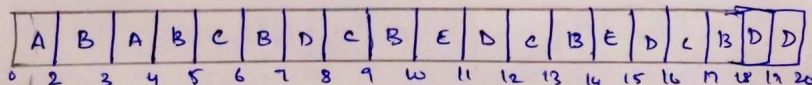
$$D = 15-4 = 11$$

$$E = 20-6 = 14$$

$$\frac{3 + 7 + 3 + 11 + 14}{5} = \frac{38}{5}$$

$$= \boxed{7.6 \text{ ms}}$$

RR:



waiting time: $(BT - AT)$

$A = 4$

$B = 16$

$C = 13$

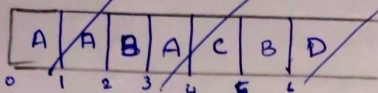
$D = 14$

$E = 7$

$$\frac{4 + 16 + 13 + 14 + 7}{5} = \frac{54}{5}$$

$= 10.8 \text{ ms}$

$A = (0 - 0) + (3 - 2) +$



waiting time: $(ST - AT)$

$A = 1$

$B = 10$

$C = 0$

$D = 9$

$E = 5$

$$\frac{1 + 10 + 0 + 9 + 5}{5} = \frac{34}{5}$$

$A = (0 - 0) + (3 - 2) = 1$

$B = 10$

$C = 0$

$D = 9$

$E = 5$

Avg WT:

$$\frac{1 + 10 + 0 + 9 + 5}{5} = \frac{34}{5}$$

$= 6.8 \text{ ms}$

Turn around time: $(CT - AT)$

$A = 4$

$B = 16$

$C = 13$

$D = 14$

$E = 7$

$$\frac{4 + 16 + 13 + 14 + 7}{5} = \frac{54}{5}$$

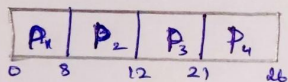
$= 10.8 \text{ ms}$

(3)

Process	AT	BT	Priority
P ₁	0	8	5
P ₂	1	4	1
P ₃	2	9	4
P ₄	3	5	2

PCFS:

Gantt chart:



waiting time:

$P_1 = 0$

$P_2 = 7$

$P_3 = 10$

$P_4 = 18$

Avg WT:

$$\frac{0 + 7 + 10 + 18}{4} = \frac{35}{4}$$

$= 8.75 \text{ ms}$

Turn around time =

$P_1 = 8$

$P_2 = 11$

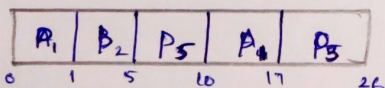
$P_3 = 19$

$P_4 = 23$

Avg TAT:

$$\frac{8 + 11 + 19 + 23}{4} = \frac{61}{4} = 15.25 \text{ ms}$$

SJF (Pre-emptive):



waiting time:

$P_1 = 9$

$P_2 = 0$

$P_3 = 15$

$P_4 = 2$

Avg WT
 $\frac{9 + 0 + 15 + 2}{4} = \frac{26}{4}$

$= 6.5 \text{ ms}$

Turn around Time:

$P_1 = 17$

$P_2 = 4$

$P_3 = 24$

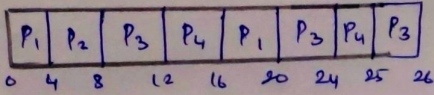
$P_4 = 7$

Avg TAT:

$$\frac{17 + 4 + 24 + 7}{4} = \frac{52}{4}$$

$= 13 \text{ ms}$

RR:



waiting time:

Avg WT:

$$\begin{aligned} P_1 &= 12 \\ P_2 &= 3 \\ P_3 &= 15 \\ P_4 &= 17 \end{aligned} \quad \frac{12+3+15+17}{4} = \frac{47}{4}$$

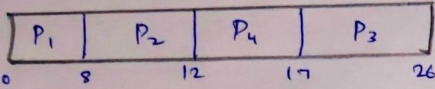
$\boxed{= 11.75 \text{ ms}}$

Turn around time:

Avg TAT:

$$\begin{aligned} P_1 &= 20 \\ P_2 &= 7 \\ P_3 &= 24 \\ P_4 &= 22 \end{aligned} \quad \frac{20+7+24+22}{4} = \frac{73}{4} = \boxed{18.25}$$

Priority (non-pre-emptive)



waiting time:

Avg WT:

$$\begin{aligned} P_1 &= 0 \\ P_2 &= 7 \\ P_3 &= 15 \\ P_4 &= 9 \end{aligned} \quad \frac{0+7+15+9}{4} = \frac{31}{4} = \boxed{7.75 \text{ ms}}$$

Turn around time:

$$\begin{aligned} P_1 &= 8 \\ P_2 &= 11 \\ P_3 &= 24 \\ P_4 &= 14 \end{aligned} \quad \frac{8+11+24+14}{4} = \frac{57}{4} = \boxed{14.25 \text{ ms}}$$