Question: 2

for the following set of processes, find average waiting time & average turn around time using Gantt chart for:

1: FCFS:

First Come First Serve (FCFS):

Process	Arrival time	Burst time
P_1	0	4
P_2	1	2
P_3	2	5
P_4	3	4

Gantt chart:

P1	P2	P3	P4

0 4 6 11 15

Process	Arrival time	Burst time	Completion time	Turn Around Time	waiting Time
P_1	0	4	4	4	0
P_2	1	2	6	5	3
P_3	2	5	11	9	4
P_4	3	4	15	12	8

Turn Around Time = Completion Time − Arrival Time

waiting Time = Turn Around Time − Burst Time

Average Turn Around Time $= \dfrac{4+5+9+12}{4}$

$= \dfrac{30}{4}$

$= 7.5$

Average waiting Time $= \dfrac{0+3+4+8}{4}$

$= \dfrac{15}{4}$

$= 3.75$

ii) SJF (Non- preemptive):

Shortest job first (Non - Preemptive):

Gantt chart:

P1	P2	P4	P3

0 4 6 10 15

Process	Arrival time	Burst time	Completion time	Turn Around time	waiting time
P_1	0	4	4	4	0
P_2	1	2	6	5	3
P_3	2	5	15	13	8
P_4	3	4	10	7	3.

Average Turn Around time $= \dfrac{4+5+13+7}{4}$

$= \dfrac{29}{4} = 7.25$

Average waiting time = $\frac{0+3+8+3}{4}$

$= 3.5$

iii) SJF (preemptive):

Shortest job First (Preemptive):

P1	P2	P3	P4	P1

0 1 3 8 12 15

Process	Arrival time	Burst time	Completion time	Turn Around time	waiting time
P1	0	4	15	15	11
P2	1	2	3	2	0
P3	2	5	8	6	1
P4	3	4	12	9	5

Average Turn around time

$= \frac{15+2+6+9}{4}$

$= 8$

Averge waiting time = $\frac{11+0+1+5}{4}$

$= 4.25$

Question: 4

Consider following snapshot.

Process	Allocated				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	1	2	1	2	1	0	1	2	2	3	2	1
P_1	1	1	0	1	1	7	5	0				
P_2	1	4	5	4	2	3	5	6				
P_3	1	4	3	2	0	4	5	2				
P_4	1	0	1	4	0	6	5	6				

a) What are contents of matrix need?

Need matrix is calculated by subtracting Allocation matrix from Max matrix.

Process	Need (Max — Allocation)			
	A	B	C	D
P_0	0	2	0	0
P_1	0	6	5	1
P_2	1	1	0	2
P_3	1	0	2	0
P_4	1	6	4	2

b) Is the system is in safe state.

m = Available = 4

n = process = 5

Available = 2 3 2 1

Finish = Finish 0 Finish 1 Finish 2 Finish 3 Finish 4

for i = 0

Need$_0$ = 0 2 0 0

Need$_0$ < Available

0 2 0 0 2 3 2 1

So P_0 must be kept in safe state

Available = Available + Allocation$_0$

= (2 3 2 1) (1 2 1 2)

Available = 3 5 3 3

for i = 1

Need$_1$ = 0 6 5 1

Need$_1$ < Available

(0 6 5 1) (3 5 3 3)

So P_1 must be kept in safe State

Available = available + Allocation$_1$

= (3 5 3 3) (1 1 0 1)

= (4 6 3 4)

for $i = 2$; $Need_2 = 1102$

$Need_2 < Available$

1102   4634

so P_2 must be kept in safe state

Available = available + $Allocation_2$

= (4 6 3 4) (1 4 5 4)

= (5 10 8 8)

for $i = 3$

$Need_3 = 10\ 20$

$Need_3 < Available$

1020   (5 10 8 8)

So P_3 must be kept in safe state

Available = Available + $Allocation_3$

(5 10 8 8) (1 4 3 2)

= (6 14 11 10)

for $i = 4$

$Need_4 = 16\ 42$

$Need_4 < Available$

(1 6 4 2)   (6 14 11 10)

so P_4 must be kept in safe state

Available = available + Allocation$_4$
(6 14 11 10) (1 0 1 4)
= (7 14 12 14)

Safe Sequence will be:
P0, P1, P2, P3, P4

c) If request for Process P1 arrives for (0,3,1,1) can the request be granted immediately?

system arrives a request P_1 for Req (0 3 1 1)

first we check if Req (P_1) is less than Need (P_1)
→ (0 3 1 1) < 0 6 5 1 True

Now we check if Req (P_1) is less than Available
→ (0 3 1 1) < 2 3 2 1 . True.

So we update the value

Available = Available − Request
= 2321 − 0 3 1 1
= 2 0 1 0.

Allocation = Allocation (P_1) + Request
= 1212 + 0 3 1 1
= 1 5 2 3

Need = Need (P_1) − Request
= 0651 − 0311
= 0340

Process	Allocation				Max				Need				Available			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
P_0	1	2	1	2	1	0	1	2	0	2	0	0	2	0	1	0
P_1	1	5	2	3	1	7	5	0	0	3	4	0				
P_2	1	4	5	4	2	3	5	6	1	1	0	2				
P_3	1	4	3	2	0	4	5	2	1	0	2	0				
P_4	1	0	1	4	0	6	5	6	1	6	4	2				

This the modified table.