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COMP2432 A4

Question 1

a)

SRT

Gantt Chart

P1	P2	P3	P2	P5	P1	P4

0 1 2 3 7 14 22 31

Waiting time and turnaround time

Process	Waiting Time	Turnaround time
P1	13	22
P2	1	6
P3	0	1
P4	18	27
P5	2	9

b)

Priority with preemption (Linux convention)

Gantt chart

P1	P2	P3	P2	P4	P2	P1	P5

0 1 2 3 4 13 16 24 31

Waiting time and turnaround time

Process	Waiting Time	Turnaround time
P1	13	24
P2	10	15
P3	0	1
P4	0	9
P5	19	26

c)

Priority with preemption (Windows convention)

Gantt chart

P1	P5	P1	P2	P4	P3

0 5 12 16 21 30 31

Waiting time and turnaround time

Process	Waiting Time	Turnaround time
P1	7	16
P2	15	20
P3	28	29
P4	17	26
P5	0	7

d)

RR with quantum Q = 3

Gantt chart

P1	P2	P3	P1	P4	P5	P2	P1	P4	P5	P4	P5

0 3 6 7 10 13 16 18 21 24 27 30 31

Waiting time and turnaround time

Process	Waiting Time	Turnaround time
P1	12	21
P2	12	17
P3	4	5
P4	17	26
P5	19	26

e)

RR with quantum Q = 2

Gantt chart

P1	P2	P1	P3	P2	P4	P5	P1	P2

0 2 4 6 7 9 11 13 15 16

P4	P5	P1	P4	P5	P1	P4	P5	P4

16 18 20 22 24 26 27 29 30 31

Waiting time and turnaround time

Process	Waiting Time	Turnaround time
P1	18	27
P2	10	15
P3	4	5
P4	18	27
P5	18	25

f)

Total weighted waiting time (w = 0.9)

= 1+ 0.9^1 + 0.9^2 + 0.9^3+0.9^4

= 4.0951

Total weighted waiting time (w = 0.8)

= 1+ 0.8^1 + 0.8^2 + 0.8^3+ 0.8^4

=3.3616

RR with quantum Q = 1

Gantt chart

P1	P2	P3	P1	P2	P4	P1	P5	P2	P4	P1	P5	P2	P4	P1

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

P5	P2	P4	P1	P5	P4	P1	P5	P4	P1	P5	P4	P1	P5	P4

15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 31

Resulting weighted waiting time (w = 0.9):

SRT Scheduling

Process	Waiting Time
P1	11.7
P2	0.9
P3	0
P4	18
P5	2

Linux convention

Process	Waiting Time
P1	13.5
P2	8.2
P3	0
P4	0
P5	19

Window convention

Process	Waiting Time
P1	6.3
P2	15
P3	28
P4	17
P5	0

Round Robin(quantum=3)

Process	Waiting Time
P1	10.1
P2	11
P3	4
P4	15.6
P5	17.6

Round Robin(quantum=2)

Process	Waiting Time
P1	13.7
P2	8.6
P3	4
P4	15.6
P5	15.9

Round Robin(quantum=1)

Process	Waiting Time
P1	10.5
P2	9.4
P3	2
P4	14.4
P5	12.8

Resulting weighted waiting time (w = 0.8) :

SRT Scheduling

Process	Waiting Time
P1	10.4
P2	0.8
P3	0
P4	18
P5	2

Linux convention

Process	Waiting Time
P1	12
P2	6.6
P3	0
P4	0
P5	19

Window convention

Process	Waiting Time
P1	5.6
P2	15
P3	28
P4	17
P5	0

Round Robin(quantum=3)

Process	Waiting Time
P1	8.3
P2	10
P3	4
P4	14.3
P5	15.3

Round Robin(quantum=2)

Process	Waiting Time
P1	10.3
P2	7.2
P3	4
P4	13.5
P5	14.1

Round Robin(quantum=1)

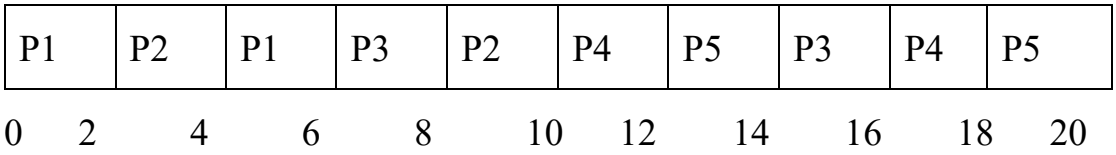
Process	Waiting Time
P1	5.8
P2	7.3
P3	2
P4	11.1
P5	10.3

Question 2

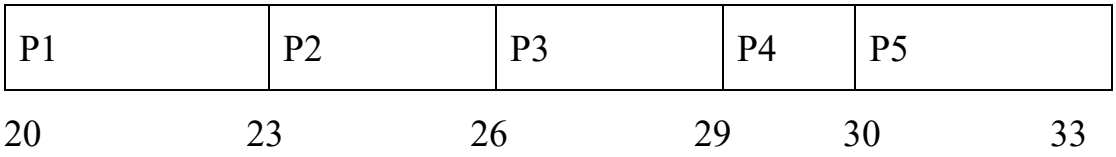
a)

Gantt chart

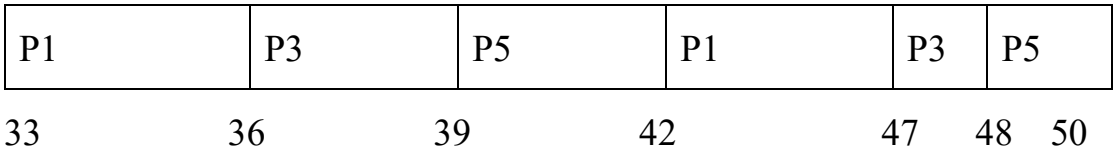
High priority queue



Medium priority queue



Low priority queue



Waiting time and turnaround time

Process	Waiting Time	Turnaround time
P1	32	47
P2	18	25
P3	35	46
P4	21	26
P5	32	44

b)

High priority queue=50/10*5=25 time units

P1	P2	P1	P3	P2	P1	P2	P4	P5	P3	P4	P5

0 2 4 6 8 10 13 16 18 20 22 24 25

Medium priority queue=50/10*3=15 time units

P5	P1	P3	P1	P4	P5

25 26 29 32 36 37 40

Low priority queue==50/10*2=10 time units

P5	P1	P5	P3	P5	P3

40 42 43 46 47 49 50

Waiting time and turnaround time

Process	Waiting Time	Turnaround time
P1	34	43
P2	10	15
P3	47	48
P4	24	33
P5	37	44

Question 3

a)

First-Fit

210K 291K 254K

84K+90K+20K	97K+81K+79K+22K	77K+64K+56K+38K

68KB no positions- waiting

Utilization:

Hole 1: Utilized 194K out of 210K (16K remaining)

Hole 2: Utilized 279K out of 291K (11K remaining)

Hole 3: Utilized 235K out of 254K (19K remaining)

Leftover space

=(210-20-84-90)+(291-97-81-79-22)+(254-77-64-56-38)

=47K

b)

Best-Fit

210K	291K	254K
84K+90KB+20KB	79K+77K+68K+56K	97K+81K+64K

38K and 22K no position- waiting

Utilization:

Hole 1: Utilized 194K out of 210K (16K remaining)

Hole 2: Utilized 280K out of 291K (11K remaining)

Hole 3: Utilized 242K out of 254K (12K remaining)

Leftover space

=(210-20-84-90)+(291-79-77-68-56)+(254-97-81-64)

=39K

c)

Worst-Fit

210K	291K	254K
97K+77K+	84K+81K+20K+64K+22K	90K+79K+56K+

68, 38KB no positions- waiting

Utilization:

Hole 1: Utilized 174K out of 210K (36K remaining)

Hole 2: Utilized 271K out of 291K (20K remaining)

Hole 3: Utilized 225K out of 254K (29K remaining)

Leftover space

=(210-77-97)+(291-84-81-64-20-22)+(254-79-90-56)

=85K

d)

Optimal 1

210K	291K	254K
56K+64K+81K	84K+90K+97K+20K	79K+77K+68K+22K

38K no position waiting

Utilization:

Hole 1: Utilized 201K out of 210K (9K remaining)

Hole 2: Utilized 291K out of 291K (0K remaining)

Hole 3: Utilized 246K out of 254K (8K remaining)

Leftover space

=(210-56-64-81)+(291-90-84-97-20)+(254-77-79-68-22)

=17K

Optimal 2

210K	291K	254K
56K+64K+68K+22K	84K+90K+97K+20K	79K+77K+81K

38K no position waiting

Utilization:

Hole 1: Utilized 210K out of 210K (0K remaining)

Hole 2: Utilized 291K out of 291K (0K remaining)

Hole 3: Utilized 237K out of 254K (17K remaining)

Leftover space

=(210-56-64-68-22)+(291-90-84-97-20)+(254-77-79-81)

=17K

e)

Yes, an improvement can be made when (iii) 210K, 291K, 255K is used, we can have 100% utilization with 0K leftover space, here is the fitting:

210K	291K	255K
56K+64K+68K+22K	77K+79K+97K+38K	90K+84K+81K

20K no position waiting

Utilization:

Hole 1: Utilized 210K out of 210K (0K remaining)

Hole 2: Utilized 291K out of 291K (0K remaining)

Hole 3: Utilized 255K out of 255K (0K remaining)

Leftover space

=(210-56-64-68-22)+(291-77-79-97-38)+(255-90-84-81)

=0K

100% utilization

f)

S=800:

x = 0

y = 8

z = 7

Total value for this combination:

36 * 0 + 48 * 8+ 59 * 7

= 384+413

= 797

Unused space

=800-797

=3K

S=775:

x = 9

y = 4

z = 5

Total value for this combination:

26 * 9 + 57 * 4 + 62 * 5

= 234 + 228 + 310

= 772

Unused space

=775-772

=3K

S=570:

x = 0

y = 7

z = 6

Total value for this combination:

29 * 0 + 39 * 7 + 49 * 6

=273 + 294

=567

Unused space

=570-567

=3K

g)

S=800:

x = 0

y = 8

z = 7

Total value for this combination:

36 * 0 + 48 * 8+ 59 * 7

= 384+413

= 797

Unused space

=800-797

=3K

S=775:

x = 23

y = 2

z = 5

Total value for this combination:

26 * 23 + 57 * 2 + 62 * 1

= 598+ 114 + 62

= 774

Unused space

=775-774

=1K

S=570:

x = 1

y = 0

z = 11

Total value for this combination:

29 * 1 + 39 * 0 + 49 * 11

=29 + 539

=568

Unused space

=570-568

=2K

h)

S=800:

x = 8

y = 8

z = 2

Total value for this combination:

36 * 8 + 48 * 8+ 59 * 2

= 288+ 384+108

= 790

Unused space

=800-790

=10K

S=775:

x = 9

y = 4

z = 5

Total value for this combination:

26 * 9 + 57 * 4 + 62 * 5

= 234 + 228 + 310

= 772

Unused space

=775-772

=3K

S=570:

x = 9

y = 4

z = 3

Total value for this combination:

29 * 9 + 39 * 4 + 49 * 3

=261 + 156 + 147

=564

Unused space

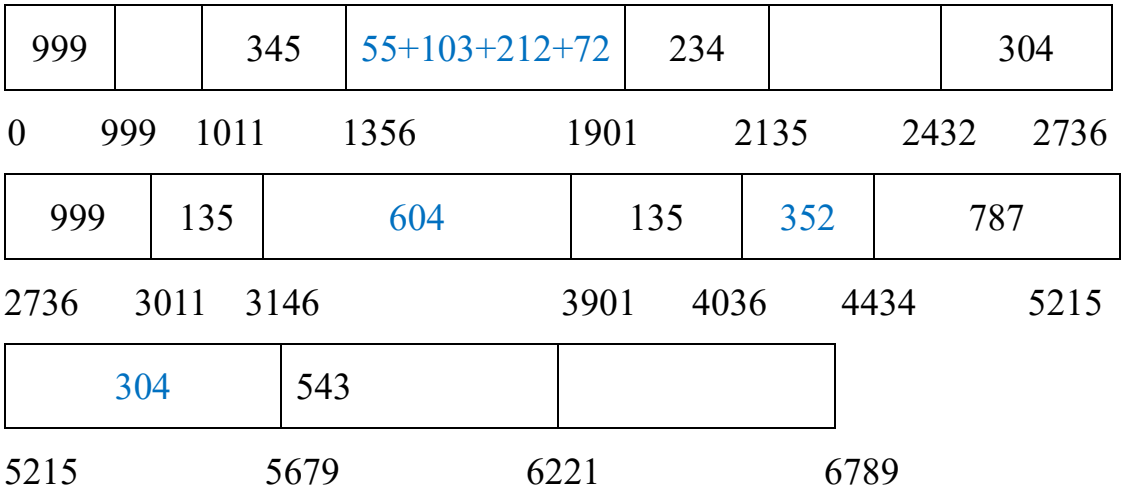
=570-564

=6K

Question 4

a)

First-Fit

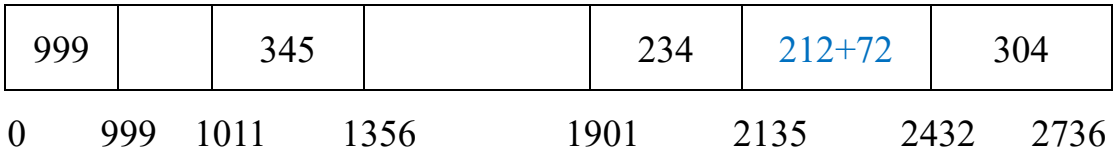


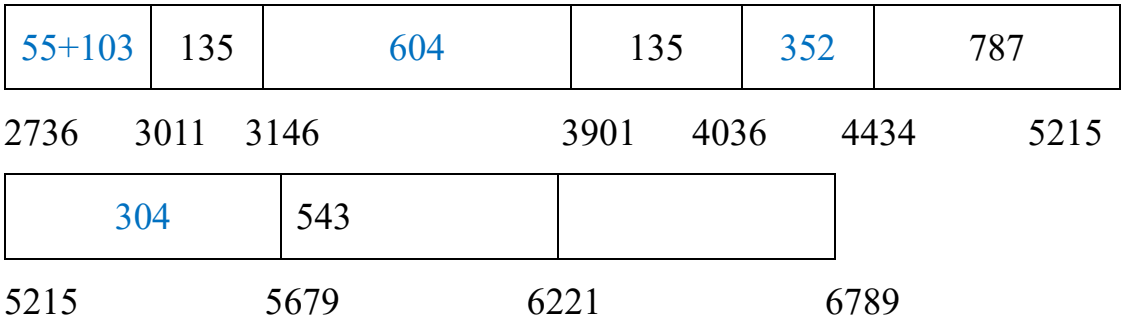
P_2

Segment	Base	Length/Limit
0	1356	55
1	3146	604
2	1411	103
3	1514	212
4	1726	72
5	4036	352
6	5215	304

b)

Best-Fit



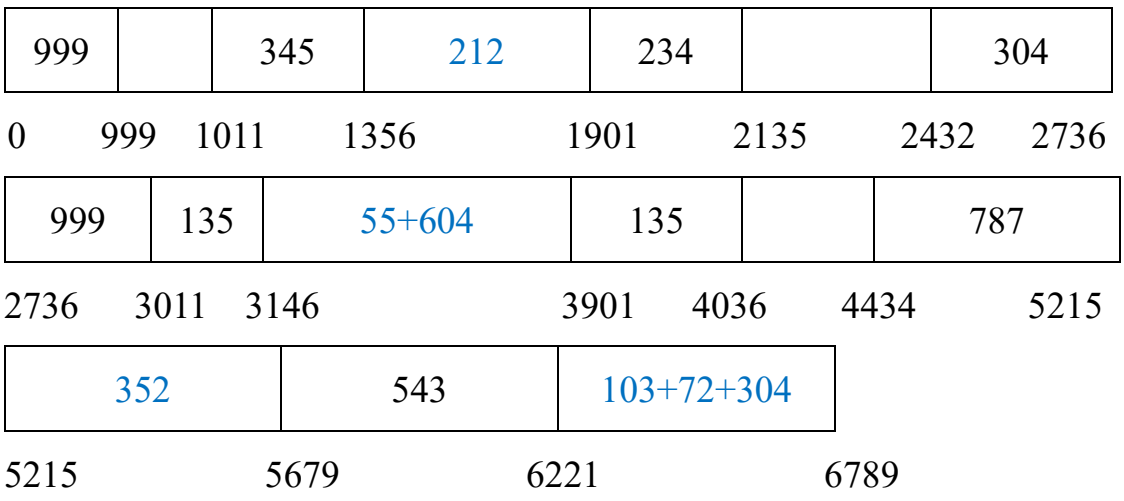


P_2

Segment	Base	Length/Limit
0	2736	55
1	3146	604
2	2791	103
3	2135	212
4	2347	72
5	4036	352
6	5215	304

c)

Worst-Fit



P_2

Segment	Base	Length/Limit
0	3146	55
1	3201	604
2	6221	103
3	1356	212
4	6324	72
5	5215	352
6	6396	304

d)

Allocation algorithm for P2		FF	BF	WF
Logical address	Physical address for P1	Physical address for P2		
(0, 44)	3055	1400	2780	3190
(1, 231)	2132	3377	3377	3432
(2, 82)	5760	1493	2873	6303
(3, 199)	2631	1713	2334	1555
(4, 56)	4490	1782	2403	6380
(5, 304)	1315	4340	4340	5519
(6, 135)	4036	5350	5350	6531