COMP2432 Operating Systems Written Assignment 1

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1. CPU Scheduling

a) SRT

P1	P2	P3	P2	P1	P4	P5

0 1 3 8 14 24 36 50

	Waiting time	Turnaround time
P1	13	24
P2	5	14
P3	0	8
P4	18	36
P5	28	50
Average	12.8	22.8

b) Priority with preemption (Linux convention)

P1	P2	P3	P2	P5	P1	P4

0 1 3 8 14 28 38 50

	Waiting time	Turnaround time
P1	27	38
P2	5	13
P3	0	5
P4	32	44
P5	6	20
Average	14	24

c) Priority with preemption (Windows convention)

P1	P4	P1	P5	P2	P3

0 6 18 23 37 45 50

	Waiting time	Turnaround time
P1	12	23
P2	36	44
P3	42	47
P4	0	12
P5	15	29
Average	21	31

d) RR with quantum Q = 5

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

0 5 10 15 20 25 30 33 34 39 44 46 50

	Waiting time	Turnaround time
P1	23	34
P2	24	32
P3	7	12
P4	28	40
P5	28	42
Average	22	32

e) RR with quantum Q = 3

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

0 3 6 9 12 15 18 21 23 26 29 31 34 36 39 42 45 48 50

	Waiting time	Turnaround time
P1	25	36
P2	22	30
P3	15	20
P4	27	39
P5	28	42
Average	23.4	33.4

f)

Process	SRT			PR-Linux			PR-Win			RR-5			RR-3		
	T=0	T=1	T=2	T=0	T=1	T=2	T=0	T=1	T=2	T=0	T=1	T=2	T=0	T=1	T=2
P1	24	28	30	38	43	46	23	25	27	34	41	48	36	48	60
P2	13	16	17	13	16	17	44	48	52	32	38	44	30	40	50
P3	5	6	5	5	6	5	47	52	57	12	14	16	20	31	39
P4	30	35	38	44	50	54	12	13	14	40	50	60	39	54	69
P5	42	48	52	20	24	26	29	32	35	42	53	64	42	59	76
Average	22.8	26.6	28.4	24	27.8	29.6	31	34	37	32	39.2	46.4	33.4	46.4	58.4

Observation:

As the context switching overhead T increases, the average turnaround time of every processes also increases for all scheduling algorithms.

2. Multi-level Scheduling

a) Fixed Priority scheduling

High priority queue

P1	P2	P1	P3	P2	P4	P3	P5	P4	P5

0 2 4 6 8 10 12 14 16 18 20

Medium priority queue

P1	P2	P3	P4	P5	P1	P4	P5

20 24 28 29 33 37 40 44 48

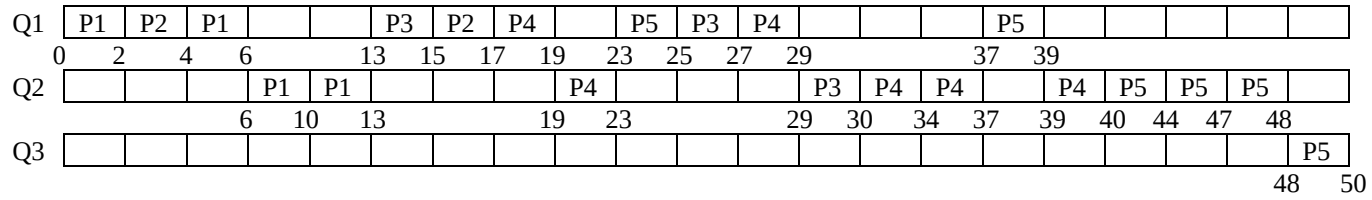
Low priority queue

P5

48 50

Process	Waiting time	Turnaround time
P1	29	40
P2	19	27
P3	21	26
P4	26	38
P5	28	42
Average	24.6	34.6

b) Time slicing scheduling



Process	Waiting time	Turnaround time
P1	2	13
P2	14	22
P3	22	27
P4	22	34
P5	28	42
Average	17.6	27.6

3. Contiguous Memory Allocation

(a) first-fit not fit-in: | 58 |

	234		321		108	
	| 50 | 88 | 96 |		| 37 | 93 | 35 | 63 | 27 | 49 | (17)		| 68 | 33 | (7)	

$$(1000 - 234 - 321 - 108 + 50 + 88 + 96 + 37 + 93 + 35 + 63 + 27 + 49 + 68 + 33) \div 1000 = \mathbf{97.6}\%$$

(b) best-fit not fit-in: | 33 | 58 |

	234		321		108	
	| 88 | 96 | 37 | (13)		| 93 | 63 | 27 | 49 | 68 | (21)		| 50 | 35 | (23)	

$$(1000 - 234 - 321 - 108 + 88 + 96 + 37 + 93 + 63 + 27 + 49 + 68 + 50 + 35) \div 1000 = \mathbf{94.3}\%$$

(c) worst-fit not fit-in: | 68 | 58 |

	234		321		108	
	| 96 | 35 | 27 | 49 | (27)		| 50 | 88 | 37 | 93 | 33 | (53)		| 63 | (45)	

$$(1000 - 234 - 321 - 108 + 96 + 35 + 27 + 49 + 50 + 88 + 37 + 93 + 33 + 63) \div 1000 = \mathbf{90.8}\%$$

(d) optimal 1 not fit-in: | 35 |

	234		321		108	
	| 49 | 88 | 96 | (1)		| 37 | 93 | 63 | 27 | 68 | 33 |		| 50 | 58 |	

$$(1000 - 234 - 321 - 108 + 49 + 88 + 96 + 37 + 93 + 63 + 27 + 68 + 33 + 50 + 58) \div 1000 = \mathbf{99.9}\%$$

(d) optimal 2 not fit-in: | 35 |

	234		321		108	
	| 50 | 88 | 96 |		| 37 | 93 | 63 | 27 | 68 | 33 |		| 49 | 58 | (1)	

$$(1000 - 234 - 321 - 108 + 50 + 88 + 96 + 37 + 93 + 63 + 27 + 68 + 33 + 49 + 58) \div 1000 = \mathbf{99.9}\%$$

(e)

If the first hole is in 235K.

not fit-in: | 33 |

	235		321		108	
	| 49 | 88 | 63 | 35 |		| 37 | 93 | 96 | 27 | 68 |		| 50 | 58 |	

The utilization will be 100%

(f)

	(f) At most 9 tasks each			(g) Unlimited number of tasks			(h) Strictly 1 to 9 tasks each		
Case	1	2	3	1	2	3	1	2	3
x	22×4	26×8	28×4	22×4	26×18	28×25	22×1	26×5	28×4
y	33×0	43×8	65×9	33×0	43×2	65×0	33×2	43×8	65×9
z	50×8	77×0	74×1	50×8	77×0	74×1	50×8	77×1	74×1
S	488	556	777	488	556	777	488	556	777
Max Usage	100%	99.2%	99.2%	100%	99.8%	99.6%	100%	99.5%	99.4%

4. Segmentation

(a), (b), (c)

	P1-S5		P1-S0		P1-S3 & P2-S4		P1-S2		P1-S6		P1-S1		P1-S4	

0 1002 1248 1433 1554 2432 2736 3131 3476 3911 4343 4431 5208 5678 6209 8191

1002 185 878 395 435 88 470 1982

Segment table for P2	Base			Length/Limit
	(a) First Fit	(b) Best Fit	(c) Worst Fit	
0	1554	2736	1554	212
1	1248	4343	1766	88
2	1766	3476	6209	345
3	6209	6209	1854	511
4	2432	2432	2432	304
5	2736	5208	5208	321
6	1336	3821	3476	72

(d)

Allocation algorithm for P2		FF	BF	WF
Logical address	Physical address for P1	Physical address for P2		
(0, 19)	1452	1573	2755	1573
(1, 88)	4519	1336	4431	1854
(2, 246)	3377	2012	3722	6455
(3, 304)	Error	6513	6513	2158
(4, 188)	5866	2620	2620	2620
(5, 234)	1236	2970	5442	5442
(6, 33)	3944	1369	3854	3509