《操作系统》课下作业 (OS-HW7)

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P456, 9.1　　Consider the following workload:

Process	Burst Time	Priority	Arrival Time
P1	50 ms	4	0 ms
P2	20 ms	1	20 ms
P3	100 ms	3	40 ms
P4	40 ms	2	60 ms

　　a. Show the schedule using shortest remaining time, nonpreemptive priority (a smaller priority number implies higher priority) and round robin with quantum 30 ms. Use time scale diagram as shown below for the FCFS example to show the schedule for each requested scheduling policy.
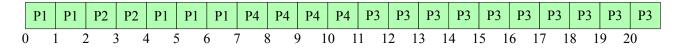
Example for FCFS (1 unit = 10 ms):

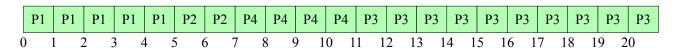| P1	P1	P1	P1	P1	P2	P2	P3	P3	P3	P3	P3	P3	P3	P3	P3	P3	P4	P4	P4	P4

0　1　2　3　4　5　6　7　8　9　10　11　12　13　14　15　16　17　18　19　20

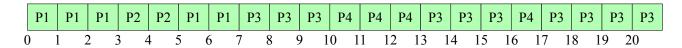**b.** What is the average waiting time of the above scheduling policies?

解. a.

Shortest Remaining Time: 新进程到达时, 总是选择剩余时间最少的进程, 抢占式.

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

0　1　2　3　4　5　6　7　8　9　10　11　12　13　14　15　16　17　18　19　20

Nonpreemptive Priority: 总是运行优先级最高的进程, 非剥夺.

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

0　1　2　3　4　5　6　7　8　9　10　11　12　13　14　15　16　17　18　19　20

Round Robin with quantum of 30 ms: 按顺序, 每个就绪进程运行 30 ms 后回到就绪队列.

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

0　1　2　3　4　5　6　7　8　9　10　11　12　13　14　15　16　17　18　19　20

b.

Shortest Remaining Time: $(20 + 0 + 70 + 10)/4 = 25$ ms.

Nonpreemptive Priority: $(0 + 30 + 70 + 10)/4 = 27.5$ ms.

Round Robin with quantum of 30 ms: $(20 + 10 + 70 + 70)/4 = 42.5$ ms.

P459, 9.16　　Five batch jobs, A through E, arrive at a computer center at essentially the same time. They have an estimated running time of 15, 9, 3, 6, and 12 minutes, respectively. Their (externally defined) priorities are 6, 3, 7, 9, and 4, respectively, with a lower value corresponding to a higher priority. For each of the following scheduling algorithms, determine the turnaround

time for each process and the average turnaround for all jobs. Ignore process switching overhead. Explain how you arrived at your answers. In the last three cases, assume only one job at a time runs until it finishes, and all jobs are completely processor bound.

a. round robin with a time quantum of 1 minute

b. priority scheduling

c. FCFS (run in order 15, 9, 3, 6, and 12)

d. shortest job first

解.

a. 轮转:

					截至本行时间
A	B	C	D	E	5
A	B	C	D	E	10
A	B	C	D	E	15
A	B		D	E	19
A	B		D	E	23
A	B		D	E	27
A	B			E	30
A	B			E	33
A	B			E	36
A				E	38
A				E	40
A				E	42
A					43
A					44
A					45

周转时间: A: 45 min; B: 35 min; C: 13 min; D: 26 min; E: 42 min.

平均周转时间: $(45 + 35 + 13 + 26 + 42)/5 = 32.2$ min.

b. 优先级:

作业 (按执行顺序)	(累计) 周转时间
B	9
E	21
A	36
C	39
D	45

周转时间: A: 36 min; B: 9 min; C: 39 min; D: 45 min; E: 21 min.

平均周转时间: $(36 + 9 + 39 + 45 + 21)/5 = 30$ min.

c. 先来先服务:

作业 (按执行顺序)	(累计) 周转时间
A	15
B	24
C	27
D	33
E	45

周转时间: A: 15 min; B: 24 min; C: 27 min; D: 33 min; E: 45 min.

平均周转时间: $(15 + 24 + 27 + 33 + 45)/5 = 28.8$ min.

d. 最短作业优先:

作业 (按执行顺序)	(累计) 周转时间
C	3
D	9
B	18
E	30
A	45

周转时间: A: 45 min; B: 18 min; C: 3 min; D: 9 min; E: 30 min.

平均周转时间: $(45 + 18 + 3 + 9 + 30)/5 = 21$ min.