

## 操作系统试卷 A 答案

### 一、Explain following terms (15 pts)

略

### 二、Short Answer (25 pts)

- (1) Thread switching does not require kernel mode privileges because all of the thread management data structures are within the user address space of a single process. Therefore, the process does not switch to the kernel mode to do thread management. This saves the overhead of two mode switches (user to kernel; kernel back to user). (2) Scheduling can be application specific. One application may benefit most from a simple round-robin scheduling algorithm, while another might benefit from a priority-based scheduling algorithm. The scheduling algorithm can be tailored to the application without disturbing the underlying OS scheduler. (3) ULTs can run on any operating system. No changes are required to the underlying kernel to support ULTs. The threads library is a set of application-level utilities shared by all applications.
- 略.
- 略.
- Simple paging:** all the pages of a process must be in main memory for process to run, unless overlays are used. **Virtual memory paging:** not all pages of a process need be in main memory frames for the process to run.; pages may be read in as needed.
- 略.
- 略.

### 三、Answer: (15 pts)

Number of frames	LRU	FIFO	Optimal
2	18	18	15
3	15	16	11

### 四、Answer: (10 pts)

- The number of bytes in the logical address space is  $(2^{16} \text{ pages}) * (2^{10} \text{ bytes/page}) = 2^{26}$  bytes. Therefore, 26 bits are required for the logical address.
- A frame is the same size as a page,  $2^{10}$  bytes.
- The number of frames in main memory is  $(2^{32} \text{ bytes of main memory}) / (2^{10} \text{ bytes/frame}) = 2^{22}$  frames. So 22 bits is needed to specify the frame.
- There is one entry for each page in the logical address space. Therefore there are  $2^{16}$  entries.
- In addition to the valid/invalid bit, 22 bits are needed to specify the frame location in main memory, for a total of 23 bits.

### 五、Answer: (20 pts)

- Sequence with which processes will get 1 min of processor time:

1	2	3	4	5	Elapsed time
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

The turnaround time for each process:

A = 45 min, B = 35 min, C = 13 min, D = 26 min, E = 42 min

The average turnaround time is =  $(45+35+13+26+42) / 5 = 32.2$  min

(2)

Priority	Job	Turnaround Time
3	B	9
4	E	$9 + 12 = 21$
6	A	$21 + 15 = 36$
7	C	$36 + 3 = 39$
9	D	$39 + 6 = 45$

The average turnaround time is:  $(9+21+36+39+45) / 5 = 30$  min

(3)

Job	Turnaround Time
A	15
B	$15 + 9 = 24$
C	$24 + 3 = 27$
D	$27 + 6 = 33$
E	$33 + 12 = 45$

The average turnaround time is:  $(15+24+27+33+45) / 5 = 28.8$  min

(4)

Running Time	Job	Turnaround Time
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3	C	3
6	D	$3 + 6 = 9$
9	B	$9 + 9 = 18$
12	E	$18 + 12 = 30$
15	A	$30 + 15 = 45$

The average turnaround time is:  $(3+9+18+30+45) / 5 = 21$  min

**六、Answer: (15 pts)**

semaphores:

var car\_available := n;

var passenger\_wait := 0;

process passenger(i := 1 to num\_passengers)

    wandering for a random time;

    signal(passenger\_wait);

    wait(car\_available);

end passenger

process car(i := 1 to num\_cars)

    wait(passenger\_wait);

    take passenger wandering;

    signal(car\_available);

end car