Thrashing：非常高速的分頁出入的現象，(行程沒有足夠欄→分頁錯誤

Operating Systems, 3rd Term Exam, Jan. 12, 2004

1. 請解釋下列專有名詞 (30%)

   (1) dynamic loading, (2) dynamic linking, (3)thrashing, (4) TLB
   (5) two-level paging, (6)fragmentation, (7)relocation,
   (8)reentrant (code) (9) locality model (locality of reference),
   (10) file allocation table

   當一個行程執行時，行程會從一個局部區域移到另一個，如果我們分配的欄位比需要少的欄，就會thrashing

2. 請由下列選項中挑選適合下列問題的答案(單複選都有可能)

   (a)page-table base register, (b) translation lookaside buffer, (c) reference bit, (d)valid/invalid bit, (e)modified/unmodified bit, (f) present/not-present bit, (g)read(able) bit, (h) write(able) bit, (i) executable bit, (j)reset page table, (k)trap (page fault), (l)bring in missing page, (m)restart instruction, (n)find the page on backing store, (o) ·

   (1) 請選出 paging system 可能需要的硬體支援.(5%)
   (2) 請依序選出處理 page fault 的過程. (5%)

3. Given memory partitions of 100K, 500K, 200K, 300K, and 600K (in order), how would each of the first-fit, best-fit, and worst-fit algorithms place processes of 212K, 417K, 112K, and 426K (in order)? Which algorithm makes the most efficient use of memory?(10%)

4. Consider the following segment table:

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

   What are the physical addresses for the following logical addresses?

   (1) 1, 10 (the first number is segment-number, the second is offset) (5%)
   (2) 2, 500 (5%)

modify bit (or dirty bit)：當字被寫入某頁，此頁之modify bit被設定，可減少分頁錯誤時間

5. Consider the following page-reference string:
1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6
How many page faults would occur for the following replacement algorithms, assuming three or four frames? (Hint: remember that all frames are initially empty.)

(1) LRU, (5%) (2)optimal replacement (5%)

6. What is the 'pipe' mechanism in Unix? (5%) What is the 'streams' mechanism in Unix System V (Hint: It is for I/O) ? (5%)

7. Why do real-time systems never have virtual memory?(5%)

8. A buffer is a memory area that stores data while they are transferred between two devices or between a device and an application. Why does an operating system need buffering? Please list two reasons.(5%)

9. Please describe the "open a file" process. (5%)

10. Consider the two-dimensional array A: int A[][] = new int[100][100];
Where A[0][0] is at location 200, in a paged system with pages of size 200. A small process is in page 0 (locations 0 to 199) for manipulating the matrix; thus every instruction fetch will be from page 0.
For three page frames, how many page faults are generated by the following array-initialization loops, using LRU replacement, and assuming page frame 1 has the process in it and the other two are initially empty. (Assume that the array is row-majored memory allocation.) (5%)

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for (int i = 0; i < 100; i++)
    for (int j = 0; j < 100; j++)
        A[i][j] = 0;
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