國立中山大學資訊工程學系

１０１學年度第１學期博士班資格考試　作業系統

INSTRUCTIONS: *If any question is unclear or you believe some assumptions need to be made, state your assumptions clearly at the beginning of your answer.*

1. Given an i-node with sixteen direct blocks and four levels of indirect blocks and assuming that the sizes of a pointer and a block are, respectively, 8 bytes and 16 Kbytes, answer the following questions.

   (a) (10%) What would be the size of the smallest file allowed in bytes?

   (b) (10%) What would be the size of the largest file allowed in bytes?

2. (20%) A disk has 8000 cylinders, each with 8 tracks of 512 blocks. A seek takes 1 msec per cylinder moved. If no attempt is made to put the blocks of a file close to each other, two blocks that are logically consecutive (i.e., follow one another in the file) will require an average seek, which takes 5 msec. If, however, the operating system makes an attempt to cluster related blocks, the mean interblock distance can be reduced to 2 cylinders and the seek time reduced to 100 microsec. How long does it take to read a 100 block file in both cases, if the rotational latency is 10 msec and the transfer time is 20 microsec per block?

3. A computer has four page frames. The time of loading, the time of last access, and the R and M bits for each page are as shown below (the times are in clock ticks):

Page	Loaded	Last Reference	R	M
0	126	279	0	0
1	230	260	1	0
2	120	272	1	1
3	160	280	1	1

   (a) (5%) Which page will FIFO replace?

   (b) (5%) Which page will LRU replace?

   (c) (5%) Which page will NRU replace?

   (d) (5%) Which page will second chance replace?

4. (20%) A small computer has four page frames. At the first clock tick, the R bits are 0111 (page 0 is 0, the rest are 1). At subsequent clock ticks, the values are 1010, 1011, 0010, 1101, 1100, 1010, 0101, 0001, 1101, and 1011. If the aging algorithm is used with a 7-bit counter, give the values of the four counters after the last ticks.

5. Assume a page reference string for a process with m frames (initially all empty). The page reference string has length p with n distinct page numbers occurring in it. For any page-replacement algorithms,

   (a) (10%) What is a lower bound on the number of page faults? **Justify your answer for full credit.**

   (b) (10%) What is an upper bound on the number of page faults? **Justify your answer for full credit.**