CprE 308 Quiz 5
Department of Electrical and Computer Engineering
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You can write on the back of the sheet.

Student Name:

1. (3 Pts) For each of the following decimal virtual addresses, compute the virtual page number and offset for a 4-KB page and for an 8-KB page: 20006, 32770, and 60011.

Answer:

For a 4-KB page size the (page, offset) pairs are (4, 3622), (8, 2), and (14, 2667). For an 8-KB page size they are (2, 3622), (4, 2), (7, 2667).

2. (3 Pts) A computer has four page frames. The time of loading, 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 Ref.	R	M
0	126	280	1	0
1	230	265	0	1
2	140	270	0	0
3	110	285	1	1

Please answer which page will be replaced using (1) NRU, (2) FIFO, (3) LRU, and (4) Second Chance, respectively.

Answer:

NRU removes page 2. FIFO removes page 3. LRU removes page 1. Second chance removes page 2.

3. (3 Pts) A computer with a 64-bit address uses a three-level page table. Virtual addresses are split into a 11-bit top level page table field, 15 bit second level page table field, and 22-bit third level page table field, and an offset. How large are the pages and how many are three in the address space?

Answer:

48 bits are used for the virtual page numbers, leaving 16 over for the offset. This yields a 64-KB page. 48 bits for the virtual page implies 2^{48} pages.