Name: _____

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Tom Nook Edition

"I certify that the following work is my work alone and I will follow the highest standards of integrity and uphold the spirit of the Honor Code"

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Orville Edition

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Directions: This is a closed book, closed notes exam. You may use a hand written 3x5 note card with notes. Please answer the questions briefly. Complete sentences are not necessary. Write your answers legibly. Unreadable answers will be counted wrong. There is a powers of 2 table on the last page.

1. Given a page request reference string of B D C A B C D E F A B D A B and a page table size of three, calculate how many page faults will occur with the optimal page replacement algorithm and LRU. If all pages are equally replaceable pick the first available.

2. Given a file system that uses inodes to represent files. Disk blocks are 8KB in size, and 16 bit pointers. This file system's index nodes have 10 direct disk blocks, as well as 3 indirect disk blocks and 2 double indirect block and a triple indirect block. What is the largest file that can be held using this inode layout?

3. Give a downside to the MFU page replacement algorithm.

4. The ext2 file is a variation of which of the three allocations schemes we discussed? Give an advantage and a disadvantage of ext2.

5. You are given a choice of two TLB. Type A executes lookups parallel and has a memory access time of 160ns and a TLB lookup time of 30ns with a 65% hit rate. Type B executes lookups in serially and has a memory access time of 160ns and a TLB lookup time of 30ns and a 70% hit rate. From a purely performance perspective, which TLB should you choose? Quantify why.

6. Explain physical and logical journals.

7. Given 2 GB of physical RAM split into 2^{14} frames and a page table with 32,768 entries, what is the maximum addressable virtual memory?

8. Explain demand paging works, its benefits and and negative consequences. How does the sliding window tie into the concept?

9. Given a swapping system in which memory consists of the following hole sizes in memory order: 20 MB, 4 MB, 10 MB, 7 MB, 18 MB, 9MB, 12 MB, and 15MB. Which hole is taken for successive requests of: 12 MB, 10 MB, 15MB, 5MB, 13MB. Give your answer for first fit, best fit, worst fit, and next fit. If a request can't fit note it can't fit and continue with the requests. You may reuse leftover space in partitions.

10. A computer provides each process with 65,536 bytes of address space divided into pages of 2048 bytes each. A particular program has a text size of 32,768 bytes, a data size of 16,386 bytes, and a stack size of 15,870 bytes. Will this program fit in the machine's address space in a non-demand paging solution? Suppose that instead of 2048 bytes, the page size were 512 bytes, would it then fit? Each page must contain either text, data, or stack, not a mixture of two or three of them.

11. For each of the following decimal virtual addresses, compute the virtual page number and offset for a 2-KB page and for an 8 KB page: 30000, 65000, 40000.

12. Describe the effects of a corrupted data block for a given file for: (a) contiguous, (b) linked, and (c) indexed

13. List and describe the 5 types of binding we discussed

14. Suppose that a machine has 48-bit virtual addresses and a 64-bit processor.
(a) What is the main advantage of a multilevel page table over a single-level one?
(b) With a two-level page table, 16-KB pages how many bits should be allocated for the top-level page table field and how many for the next-level page table field? Explain.

 = 1pt.

n	2^n	n	2^n	n	2^n
0	1	11	2,048	22	4,194,304
1	2	12	4,096	23	8,388,608
2	4	13	8,192	24	16,777,216
3	8	14	16,384	25	33,554,432
4	16	15	32,768	26	67,108,864
5	32	16	65,536	27	134,217,728
6	64	17	131,072	28	268,435,456
7	128	18	262,144	29	536,870,912
8	256	19	524,288	30	1,073,741,824
9	512	20	1,048,576	31	2,147,483,648
10	1,024	21	2,097,152	32	4,254,967,296