# Final Quiz Operating Systems II

Total points 24.5/50

The respondent's email (**cs20btech11063@iith.ac.in**) was recorded on submission of this form.

0 of 0 points

Please enter your name *

Tanmay Garg

Please enter your student ID number *

CS20BTECH11063

Questions 19 of 27 points

✓ Increasing the number of processes always increases the CPU utilization. 1/1

- ○ True
- ◉ False ✓

**Feedback**

*Thrashing is one common reason why utilization might reduce with increasing concurrency.*

✓ What kind of process scheduling policy is used in default implementation of xv6? 1/1

- ○ FIFO
- ○ LRU
- ○ Priority scheduling
- ◉ Round-robin ✓

✓ The problem of write amplification (one write creates multiple read/write accesses internally) occurs in 1/1

- ○ NVMe
- ○ SSD
- ○ USB Flash drive
- ◉ All of these ✓

✓ Which of the following is correct for a loadable section of an ELF file? 1/1

- ◉ memsz >= filesz ✓
- ○ memsz <= filesz
- ○ memsz = filesz
- ○ There is no defined relation between memsz and filesz

✓ Which of these steps is NOT necessary to implement demand paging in xv6? Choose the best option if multiple entries seem correct 1/1

- ○ Updating trap handler for page fault support
- ◉ System call to display page tables to the user ✓
- ○ Modifying exec function to not allocate frames for all the pages
- ○ All these steps are necessary

✗ What does P2V function/macro in xv6 do and why is it needed? 1/2

It converts physical memory address into virtual memory address. This data can then be used by processes for various purposes related to

✓ The general objective of an operating system is to increase the CPU utilization. Under what requirements can the OS attempt to reduce the CPU utilization? 3/3

CPU would have to reduce utilization, when a lot of unnecessary processes will be taking place that are taking control of the entire CPU utilization, such as in the case of virus attacks, in that case the CPU will have to terminate such processes in order to reduce the utilization. Other reason could be excessive overheating, in that case CPU will throttle down to reduce the CPU utilization and to increase cooling to reduce the temperature

**Individual feedback**

*temperature related reason was sufficient.*

✗ What are the main problems with Elevator (Scan) algorithm used in disk scheduling and how does C-SCAN solve it? 0/2

In

✗ Copy-on-write makes use of the following control bit of page table entry 0/1

- (●) Valid ✗
- ( ) Write
- ( ) Accessed
- ( ) User Mode

Correct answer

- (●) Write

✓ Which of the following is NOT a benefit provided by RAID structure for disks 1/1

- (●) No disk seek/rotational latency ✓
- ( ) Higher performance
- ( ) Higher reliability
- ( ) All benefits are applicable to RAID

✗ What is one of the problems with using least-frequently-used (LFU) page replacement policy? 0/2

It causes starvation of processes

✗ A slab allocator eases which of the problem of a buddy allocator? 0/1

- (●) External fragmentation ✗
- ( ) Internal fragmentation
- ( ) Time wasted in dividing/coalescing to create or merge buddies
- ( ) None of the above

Correct answer

- (●) Internal fragmentation

✓ What should be the value of the rwx-rwx-rwx bits for a file in Linux such that the file is readable by the owner and group members, but not by others. Choose the suitable one from the given choices. 1/1

- ○ 101-101-101
- ○ 000-101-101
- ◉ 101-101-000 ✓
- ○ 111-111-111
- ○ 101-000-101

✓ Which of the following allows us to have the same page table across different processes. 1/1

- ○ 2-level page table
- ○ Hashed page table
- ◉ Inverted page table ✓
- ○ 1-level page table

✓ Limited endurance is a common problem with hard disks which is solved by the SSDs and NVMe. 1/1

- ○ True
- ◉ False ✓

✓ Concurrently creating two files in the same directory does not require any lock as the two files would be assigned separate inodes. 1/1

- ○ True
- ◉ False ✓

✗ What would determine the limit on the maximum number of files that could be present within a directory? 1/2

FAT32 type file system and NTFS type file system decides the maximum number of files and maximum file size

✓ The I/O specific instructions (e.g., IN and OUT) can be executed in user mode as well as kernel mode. 1/1

- ○ True
- ◉ False ✓

✓ Hard disks suffer longer delays for which kind of data accesses? 1/1

- ◉ Random ✓
- ○ Sequential

✓ Which of these is NOT a benefit provided by virtualization 1/1

- ○ Live migration
- ◉ Faster execution ✓
- ○ Isolation
- ○ Taking snapshots

✓ Shadow page table used in virtualization translates a guest virtual address to 1/1

- ○ Guest physical address
- ○ Host (VMM) virtual address
- ◉ Host (VMM) physical address ✓
- ○ None of the above

## Numericals

5.5 of 14 points

✓ Consider a process size of 45327 bytes and a page size of 2KB (1KB=1024 Bytes). What is the total number of bytes lost due to internal fragmentation? Give a brief description of your calculations. 3/3

1777 Bytes were lost due to internal fragmentation. We need greater than 22 page tables to accommodate the process, hence we need 23 page tables which take total space of 47104 Bytes so the difference is the lost part

✗ Consider that the virtual address consists of 27-bits and OS uses paging for memory management. Consider that the page size is 2 KB. Find the maximum number of pages that can be present in the system. Give a brief description of your calculations. 2.5/3

greater than 2^16 pages. 2^27 addressable bytes and page size is 2^11 Bytes, so 2^27/2^11

**Individual feedback**

*why greater? It is exactly 2^16*

✗ Consider that the virtual address consists of 27-bits and OS uses paging for memory management. Consider that the page size is 2 KB. Assume that the physical memory is 1 MB (20-bit address space). Find the number of bits per entry in the page table for Virtual to physical page translation (ignore the control bits, just consider the mapping bits). Give a brief description of your calculations. 0/4

✗ Consider memory access time of 100 ns and TLB hit rate of 0.90 (90%). Find the effective access time when 1-level page table is used. Give a brief description of your calculations. 0/2

15ns

✗ Consider memory access time of 100ns and TLB hit rate of 0.90 (90%). Find the effective access time when 2-level page table is used. Give a brief description of your calculations. 0/2

10ns

## Common data questions - paging

0 of 9 points

Consider Page size: 4 KB, Virtual address: 32-bits, Physical address: 22-bits, Process memory size: 13465 bytes, Each page table entry is 32-bits (4 Bytes). Assume 1KB=1024 bytes. Answer the following questions for such a setup. Give a brief description of your calculations or justifications.

✗ Space wasted due to external fragmentation when allocating memory to the process. 0/1

✗ Space wasted due to internal fragmentation when allocating memory to the process. 0/1

✗ Page-table size (number of mappings) when using a single level page table. 0/1

✗ Page-table size (number of mappings) when using an inverted page table. 0/2

✗ Total memory size (in bytes/KB/MB) used by page-tables with a single level page table, when there are 8 copies of the same process active in the system. 0/2

✗ Total memory size (in bytes/KB/MB) used by page-tables with a inverted page table setup, when there are 8 copies of the same process active in the system. 0/2