Revision

OPS Lecture 19, G53OPS/G52OSC

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Rubric
G52OSC

Candidates may complete the front cover of their answer book and sign their desk card but must NOT write anything else until the start of the examination period is announced

Answer THREE Questions, INCLUDING:
at least one operating systems question (Questions 1, 2 or 3)
AND at least one concurrency question (Questions 4 or 5)

Only silent, self-contained calculators with a Single-Line Display are permitted in this examination.

Dictionaries are not allowed with one exception. Those whose first language is not English may use a standard translation dictionary to translate between that language and English provided that neither language is the subject of this examination. Subject specific translation dictionaries are not permitted.

No electronic devices capable of storing and retrieving text, including electronic dictionaries, may be used.

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Rubric

G53OPS

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You must answer THREE questions out of FIVE
(Only the THREE nominated solutions will be marked)

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Assessment
What Should You Expect

- A **120 minute exam** that focusses on:
  - **Knowledge**
  - **Comprehension**
  - **Application**
- I have mainly included examples of **comprehension and application** here
- The **G53OPS exam** will be 3 out of 5 questions, with 100% exam for assessment
- The **G52OSC exam** will be 3 out of 5 questions, with 75% of the assessment on the exam (3 OPS, 2 CON questions, at least one of each)

Question 1

Comprehension

"Describe how, in your opinion, ***recent developments in computer architecture*** *and computer design have* ***influenced operating system design****. Include aspects on* ***processes management****,* ***memory management****,* ***file system design****, and* ***disks****. " [10 marks]*

Question 2

Comprehension

"Keeping in mind the implementation differences between threads and processes on an operating system level, explain ***why thread creation and switching*** *are* ***faster than process creation and switching****." [3 marks]*

Question 2

Comprehension

*"In which situations would you **favour user level threads**? In which situations would you **favour kernel level threads**. Explain your answer." [2 marks]*

Question 2

Comprehension

*"**Round Robin is said to favour CPU bound processes** over I/O bound processes. Explain why may this be the case (if this is the case at all) [2 marks]? "*

Question 2

Application

*"Illustrate the use of **round robin**, **shortest job first**, and **highest priority first** scheduling algorithms for the processes given below (all processes arrive at the same time)."*

- *Give the **order** in which the processes are scheduled, together with the times at which they will start / end / are interrupted. You can assume a **time slice of 15 milliseconds** of the round robin algorithm. You can illustrate your answer using Gantt charts if you prefer [3 marks].*
- *What is the **average response time** for each of the algorithms above [3 marks]?*
- *What is the **average turnaround time** for each of the algorithms above [3 marks]?*

Question 2

Application

	FCFS Position	CPU burst time	Priority
Process A	1	31	1 (high)
Process B	2	57	1 (high)
Process C	3	11	2 (low)
Process D	4	15	2 (low)

Question 3

Comprehension

“ Explain why hard links do not work across different machines.” [2 marks]

Question 3

Application

*"**Cylinder skew** adds an **offset** to the sectors on adjacent cylinders on traditional magnetic hard drives. If a disk rotates at **10000 rpm**, the **seek time** between two adjacent cylinders is 1 millisecond, and each track contains **600 sectors**, how many sectors should the cylinder skew be?"* [2 marks]

Question 3

Application

*"Consider a disk with **300 tracks**, and the **following sequence** of requested tracks 61, 149, 230, 48, 216, 54, 192, 262, 220, 255. Calculate the number of tracks crossed when the following algorithms are used. Assume that the disk **starts at position 66** and is moving in the up position (i.e. 1 to 300). '*

- *First come first served*
- *Shortest seek time first*
- *Circular scan algorithm with a look function (i.e. the arm does not move to the boundaries of the disk if not required), moving in the up position.*

" [6 marks]

Question 4

Knowledge

"Briefly describe 3 contiguous memory schemes based on partitioning. [6 marks]

Question 4

Comprehension

What is thrashing? Explain why it can happen. [2 marks]

Question 4

Knowledge

"Describe the principle behind address relocation. Why is it necessary and why is it useful?" [4 marks]

Question 4

Comprehension

"*Out of the following four scheduling algorithms, which one can lead to starvation:* ***FCFS***, ***shortest job first***, ***round robin***, ***highest priority first***? *Explain your answer."* [2 marks]

Question 4

Application

*"Consider a computer that has **1 GB of memory**. 200 Mb is reserved for the **operating system**, and each process takes on **average 200Mb**. By how much would you expect the CPU utilization to increase by adding an **additional gigabyte of memory**? Assume that the **I/O rate is 80%** and that each additional process takes up 200Mb."* [2 marks]

Question 5

Knowledge

"Explain virtual memory with paging. Include an explanation of address translation work in a paged system with virtual memory and a single level page table. Illustrate your answers where possible." [9 marks]

Question 5

Comprehension

"Is the page table of a process updated in user or in kernel mode? Explain your answer. " [2 marks]

Question 5

Application

“ Consider the following decimal addresses: 24575, 29645, and 44719. What are their virtual page numbers and offsets for a 4KB page size?” [3 marks]

Question 5

Application

“ Translation look aside buffers are used to speed up address translation. Assuming the following numbers/access times

- *A 12ns associative TLB lookup*
- *A 150ns memory access time*
- *A single level page table*

Calculate the access time for a TLB hit, a TLB miss, and the estimated access time and slowdown for a 95% hit rate. ” [3 marks]