C502 – Memory Management Quiz

Quiz Solutions

Note: The solution notes below only briefly list (some of) the key points that should be included in an answer. They are by no means complete. In an exam, you are expected to spell out the solution more fully and include a detailed explanation of your reasoning.

1. Where is the 'swap space' located?

   (a) Designated area in memory
   (b) CPU Cache
   (c) Hard disk

   Answer: *(c) Hard disk – 'swap space' is a dedicated area of disk where memory data can be swapped out into and later swapped back into memory, as necessary.*

2. Consider a 16-bit Virtual memory address and a page size of 8 KB. How many pages can a process potentially have?

   (a) 8
   (b) 2
   (c) 10
   (d) 4

   Answer: *(a) 8. A page size of 8 KB will have 2^{13} bytes and in order to address these bytes we would need 13 bits. The remaining bits are used fo we potentially have $2^3 = 8$ pages.*
   Can also calculate as: $\frac{number\ of\ virtual\ addresses}{page\ size} = \frac{2^{16}}{2^{13}}$

3. What causes a page fault?

   (a) The page is not available on disk
   (b) The page is faulty
   (c) The page is not available in memory
   (d) The page is dirty
   (e) The page shouldn't be accessed

   Answer: *(c) The page is not available in memory. A page fault is caused when there is an invalid-bit in the page table is set to 0, which indicates that the requested page is not in memory and must hence be brought into memory.*

4. Increasing the RAM size usually helps with performance. Why?

   (a) Increase in virtual memory
   (b) Faster physical memory
   (c) Not as many segmentation faults
   (d) Reduced Thrashing
   (e) Fewer memory leaks

Answer: *(d) Reduced Thrashing. Increasing RAM indicates that we are increasing the physical memory and not necessarily the virtual memory since virtual memory is independent of the physical memory and depends on the address size. Increasing RAM doesn't necessarily lead to a faster memory as that has to do with the hardware of the RAM. Increasing RAM would allow us to allocate more frames to processes which in turn would lead to fewer page faults (reduced thrashing) and hence an overall improvement gain.*

5. Assume 3 memory frames and a reference string of 1, 2, 3, 6, 2, 1, 5, 3, 2, 4, 6. How many page faults do you get when using the Optimal Algorithm?

   (a) 4
   (b) 5
   (c) 6
   (d) 7
   (e) 8

   Answer: *(d) 7.*

   Reference string

1	*2*	*3*	*6*	*2*	*1*	*5*	*3*	*2*	*4*	*6*
1	*1*	*1*	*1*			*1*	*3*		*4*	
	2	*2*	*2*			*2*	*2*		*2*	
		3	*6*			*6*	*6*		*6*	