

Quiz Sheet #4

Problem 4.1: *true or false*

(5 points)

true false

- ☐ ☐ Functions like `malloc()` and `free()` use the stack to allocate memory.
- ☐ ☐ The `mmap()` system call, which can be used to allocate memory that is shared between multiple processes, may be used to establish a shared stack space between processes.
- ☐ ☐ The symbol `h` is stored in to the writable stack segment when it is declared using the statement `char * const h`.
- ☐ ☐ A string literal such as `"Hello"`, by virtue of being constant, may be stored in a read-only data segment.
- ☐ ☐ An executable code segment, such as a function `foo()`, will be stored in the read-only text segment by the compiler on platforms that support memory protection.

Solution:

true false

- ☐ ☒ Functions like `malloc()` and `free()` use the stack to allocate memory.
- ☐ ☒ The `mmap()` system call, which can be used to allocate memory that is shared between multiple processes, may be used to establish a shared stack space between processes.
- ☐ ☒ The symbol `h` is stored in to the writable stack segment when it is declared using the statement `char * const h`.
- ☒ ☐ A string literal such as `"Hello"`, by virtue of being constant, may be stored in a read-only data segment.
- ☒ ☐ An executable code segment, such as a function `foo()`, will be stored in the read-only text segment by the compiler on platforms that support memory protection.

Problem 4.2: buddy system

(5 points)

Consider a system where a 1 MB block of memory is allocated using the buddy system. The following table defines the memory allocation at time t_0 .

t_0	1024 KB
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The next table defines the memory allocations and deallocations starting with time t_1 .

Time	Process	Request	Release
t_1	A	70 KB	
t_2	B	182 KB	
t_3	C	425 KB	
t_4	A		70 KB
t_5	C		425 KB
t_6	D	628 KB	
t_7	B		182 KB
t_8	E	256 KB	

Show the complete memory allocations for all $t \in \{t_1, \dots, t_8\}$ by filling out the table below, which has a row for each t . You must indicate the size of each free memory block available within the table and if an allocation error occurs. When several free blocks of appropriate size are available for allocation or splitting, always choose the left one.

t_0	1024 KB	Failure
t_1		
t_2		
t_3		
t_4		
t_5		
t_6		
t_7		
t_8		

Solution:

t_0	1024 KB				Failure
t_1	A	128 KB	256 KB	512 KB	
t_2	A	128 KB	B	512 KB	
t_3	A	128 KB	B	C	
t_4	256 KB		B	C	
t_5	256 KB		B	512 KB	
t_6	256 KB		B	512 KB	*
t_7	1024 KB				
t_8	E	256 KB	512 KB		