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| **CS 224, Sp2015**  **Homework #7**  **S09: Structs** | Name | Section | Score  / 40 |
| Questions: | Answers: | | |
| 1. (4 points) (Unions) Consider the code segment below. If the variable **c**’s value is **0x053e**, what are the values of variables **i**, **f**, and **d**? Why?  **union**  **{ char c;**  **int i;**  **float f;**  **double d;**  **} x;**  **char\* c = &x.c;**  **int\* i = &x.i;**  **float\* f = &x.f;**  **double\* d = &x.d;** | a) If the variable **c**’s value is **0x053e**, what are the values of variables **i**, **f**, and **d**?  b) If the value of **x.i** equals **258**,what is the value of **x.c**? | | |
| 2. (6 points) (static/malloc) Using the following C program, answer the questions to the right.  **#define MAX\_LEN 20**  **char \*LowerCase(char \*s);**  **int main()**  **{ char str[MAX\_LEN];**  **strcpy(str, "Now Is The Time");**  **printf("%s", LowerCase(str));**  **}**  **char \*LowerCase(char \*s)**  **{ char newStr[MAX\_LEN];**  **int i;**  **for (i = 0; i < MAX\_LEN; i++)**  **{**  **newStr[i] = ('A'<=s[i] && s[i]<='Z')**  **? s[i] + ('a' - 'A') : s[i];**  **}**  **return newStr;**  } | a) What will the **main** program print?  b) What is the defect in the **LowerCase** function?  c) How would you fix this defect? | | |
| 3. (4 pts) (malloc) Considering the following code segment, answer the questions to the right.  **typedef struct waw**  **{ char \*hello;**  **int bye;**  **} WAW;**  **typedef struct wow**  **{ char \*name;**  **WAW \*test;**  **} WOW \*hi;**  **void FOO()**  **{ hi = (WOW\*)malloc(sizeof(WOW));**  **hi->name = (char\*)malloc(256);**  **hi->test = (WAW\*)malloc(sizeof(WAW));**  **hi->test->hello = (char\*)malloc(256);**  **}**  **int main()**  **{ FOO();**  **}** | a. How many bytes of memory are malloc’d after the function **FOO** is called?  b. Code the correct way to free all memory malloc’d in the function **main**. (Note: ints and pointers are allocated 2 bytes.) | | |
| 4. (4 points) (structs) Given the following C program, write the MSP430 assembly instruction(s) generated by the compiler for the indicated line:  **struct node**  **{ int count;**  **struct node \*next;**  **};**  **int main(void)**  **{ int data = 0;**  **struct node \*getdata;**  **getdata = getdata->next;**  **return 0;**  **}** |  | | |
| 5. (6 pts) (Activation records) Answer the questions to the right using the following code. (**char**’s are 1 byte, **int**’s and pointers are 2 bytes, and **float**‘s are 4 bytes.)  **typedef struct element**  **{ char name[10];**  **int atomic\_number;**  **float atomic\_mass;**  **} Element;**  **int is\_it\_noble(Element t[], int i)**  **{ return ((t[i].atomic\_number == 2) ||**  **(t[i].atomic\_number == 10) ||**  **(t[i].atomic\_number == 86));**  **}**  **int main(void)**  **{ int x, y = 4;**  **Element periodic\_table[10];**  **x = is\_it\_noble(periodic\_table, y);**  **return x;**  **}** | a. What is the size (in bytes) of the activation record for the function **is\_it\_noble** (include the return address)?  b. Assuming that **periodic\_table**, **x**, and **y** are the only local variables, what is the size (in bytes) of the activation record for the function **main**? | | |
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