Midterm Two Redux

Name: _____

You have 45 minutes. The exam is closed book. Some questions have multiple answers.

WRITE YOU NAME ABOVE. RECORD YOUR ANSWERS BELOW!

Q	Answer	Points
1	(a) (b) (c) (d)	
2	(a) (b) (c) (d)	
3	(a) (b) (c) (d) (e)	
4	(a) (b)	
5	␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣␣	
6	- Fill in the blank in booklet -	
7	_____	
8	- Fill in the blank in booklet -	
9	- Fill in the blank in booklet -	
10	(a) (b) (c) (d) (e)	
11	- Fill in the blank in booklet -	
12	- Fill in the blank in booklet -	

1

Consider the following code snippet, which, if any, of the following statement apply?

```
int* p=&'a'; (*p)++; putchar(*p);
```

(a) A segmentation fault occurs at runtime. **(b)** Character `b` will be printed. **(c)** The ASCII representation of 42 will be printed. **(d)** The compiler will reject the program.

2

Consider the following definitions:

```
char* a[] = {"abc","def"};
char c = *((char*)a+2);
```

What statements apply to value of `c`? **(a)** `c` can have any value. **(b)** `c` has value `'c'` **(c)** `c` has value `'f'` **(d)** A segmentation fault occurs at runtime.

3

Which of the following statements define a variable `a`?

(a) `struct my_struct {int i; int j;} a;`
(b) `struct {int i; int j;} a;`
(c) `struct a {int i; int j;};`
(d) `typedef struct my_struct {int i; int j;} a;`
(e) `typedef struct {int i; int j;} a;`

4

On 32-bit system, will the following initialization code of `s` overflow `buf` in `wrong`?

```
char s[200];
void wrong(){char buf[4];strcpy(buf, s);}
int main() {
  for(int i=0;i<50;i++) *((int*)(s+i*4))=0xff00;
  wrong();
}
```

(a) yes (because `strlen(s)` will be larger than 4 after the loop) **(b)** no

5

Consider the following preprocessor directives:

```
#define P(A) Q(A); Q(A)
#define Q(B) printf("%s",B);printf("%s",B)
```

What will `P("ha");` print?

6

Consider the following program.

```
#define P(A) printf("%s:", A);
int main() {
 static struct S1{char c[4], *s;} s1 = {"abc", "def" };
 static struct S2{char* cp;struct S1 ss1;} s2={"ghi",{"jkl", "mno"}};
 P(&(s1.c[0])); P(s2.ss1.s);
 P(++s2.cp); P(++s2.ss1.s);
}
```

Write down its output.

7

On a 32-bit architecture, how many bytes of storage are needed for the following (total):

```
#define MAX 10
#define NUM 3
char H[MAX]; char* h=H;
```

8

Following Question 7, your task is to write a simple character allocator. The memory for your allocator comes from a single statically allocated array of characters. You need not support free(). Someone in your team started writing the function, you only need to fill in the blanks.

```
char* mymalloc(unsigned int x) {
  if (h+x > (H + (MAX))) return NULL;
  ________;        _____;      return ____;
}
```

9

Following Question 8, your task is to write a main() that starts 3 threads which all execute the function hi, which itself uses mymalloc. Fill in the main function.

```
void* hi(void* v){
  while(1){
   char* str = mymalloc(4); if(str==NULL)break;
   for(int i =0;i<3;i++)if(str[i]==0)str[i]='.';
   str[(long) v]='x'; str[3]='|';
  }
  return NULL;
}

int main () {
  // spawn all threads



    pthread_create(__________, NULL, hi, (void *) _____);




  // wait for threads to complete









  // output
  puts(H);
  return 0;
}
```

10

Following Question 9, which of the following outputs are possible?

(a) x..|.x.|..x|
(b) .x.|..x|x..|
(c) xx.|...|..x|
(d) xx.|..x|
(e) .xx|.x.|

11

Consider the following program running on a 32-bit system. Note the calls to qsort with arguments of different types.

```
int main(){
  int v_int[LEN] = {4,3,2,1};
  char* v_str[LEN] = {"hf", "abc","ab", "d"};
  qsort(v_int,0,LEN-1,cmp_int);
  qsort(v_str,0,LEN-1,cmp_str);
  return 0;
}
```

Write the function cmp_int:

```
_____ cmp_int(___ x,____ y) { return _____________________;  }
```

12

Building on the previous question, fill in the blanks in the definition of qsort.

```
void swap(_____, int i, int j) {void *t=v[i]; v[i]=v[j]; v[j]=t; }
void qsort(_____, int l, int r, _____) {
  if (l >= r) return;
  swap(v, l, (l + r)/2);
  int last = l;
  for(int i=l+1;i<=r;i++) if ( _____ (v[i],v[l])<0) swap(v,++last,i);
  swap(v, l, last);
  qsort(v, l, last-1, _____);  qsort(v, last+1, r, _____);
}
```