# hw9: Linking and Loading Results for VARDAAN KAPOOR (He/him)

Score for this attempt: **7** out of 8 Submitted May 5 at 5:59pm This attempt took 22 minutes.

Correct!

Correct!

```
1 / 1 pts
Question 1
Consider the following code:
 int arr[ 8 ];
 int* p = arr;
 int val = 0;
 void main() {
    int x;
    static int y;
    printf("end of main\n");
 }
The specific memory areas variable y and the string "end of main\n"
will be stored in are .bss and .rodata respectively.
Answer 1:
    .bss
Answer 2:
    .rodata
```

```
int func(int val);
int x = 34;
int main() {
  int y;
  y = func(x);
```

return 0; }
The code above is compiled with only the -c flag to create an object file named main.o. In which section of the ELF formatted object file is <b>the</b> location in the assembly code where func(x) is called found?
○ .rel.data
○ .symtab
.rel.text
○ .data
O .bss

Correct!

Question 3

```
#include <stdio.h>
int func(int val);
static int x = 34;
extern int z;

static int doubleIt(int val) {
    return 2*val;
}

int main() {
    int y;
    y = func(x);
    int *a = &y;
    int b = doubleIt(z);
    printf("%d\n", b);
    return 0;
}
```

Select **ALL** the correct statements with respect to the above code?

References to the variable  $\boldsymbol{x}$  in the code above will need relocation during linking.

#### Correct!

**✓** 

References to the function func in the code above will need relocation during linking.

References to the function doublelt in the code above will need relocation during linking.

#### Correct!



References to the variable z in the code above will need relocation during linking.

# **Question 4**

1 / 1 pts

### Given the following main.c

```
int a[2] = {1, 2};
int b[4];
int c = 68;

int main() {
  return 0;
}
```

## and the symbol table extracted from main.o

```
Num: Value Size Type Bind Vis Ndx Name
8: 00000000 8 OBJECT GLOBAL DEFAULT 2 a
9: 00000004 16 OBJECT GLOBAL DEFAULT COM b
10: X 4 OBJECT GLOBAL DEFAULT 2 c
11: 00000000 10 FUNC GLOBAL DEFAULT 1 main
```

#### The value of X is:

#### Correct!

8

orrect Answers

8 (with margin: 0)

Question 5

### Consider the following code:

```
static int a(void) {
   return 0 + 0;
}

extern int b;
int c = 11;

int main() {
   int d = a();
   return d;
}
```

Select **ALL** the options that will have an entry in the symbol table '.symtab'?

d

Correct!

✓ a

Correct!

✓ b

Correct!

✓ c

Correct!

main

# **Question 6**

1 / 1 pts

# Consider the following 3 programs:

```
1
                2
                                 3
                                  //contents of f
 //contents o
                 //contents of
 f file foo.
                 file foo.c:
                                  ile foo.c:
                 int a = 5;
                                  static int a =
 static int a
                int main() {
                                  5;
                                  int main() {
 = 5;
                         f();
 int main() {
                         retur
                                          f();
        f();
                n 0;
                                          return
        retur
                 }
                                  0;
```

```
n 0;
                //contents of | }
                                //contents of f
                 file bar.c:
 }
 //contents o
                 extern int a;
                                ile bar.c:
                                int a;
 f file bar.
                void f() {
                        print
                               void f() {
                f("%d\n", a);
 static int a
                                 printf
                                 ("%d\n", a);
 = 10;
 void f() {
         prin
 tf("%d\n",
 a);
 }
 //contents of file bar.c:
 int a;
 void main() {
        printf("%d\n", a);
If the command "gcc foo.c bar.c" is executed, which of the above
programs result in a linker error?
    1 and 2
    2 and 3
    1 only
   2 only
    1, 2, and 3
    3 only
                                                             0 / 1 pts
```

# Consider the following makefile:

**Question 7** 

Correct!

```
main: main.o func1.o
       gcc main.o func1.o -o main
main.o: main.c
```

```
gcc -c main.c
func1.o: func1.h func1.c
gcc -c func1.c
```

Also consider the following directory listing:

```
-rw-r---- 1 skrentny skrentny 84 Dec 6 09:42 func1.c
-rw-r---- 1 skrentny skrentny 18 Dec 6 09:43 func1.h
-rw-r---- 1 skrentny skrentny 1488 Dec 6 10:11 func1.o
-rwxr-x--- 1 skrentny skrentny 6558 Dec 6 10:16 main*
-rw-r----- 1 skrentny skrentny 130 Dec 6 09:44 main.c
-rw-r---- 1 skrentny skrentny 1608 Dec 6 10:16 main.o
-rw-r---- 1 skrentny skrentny 120 Dec 6 09:40 Makefile
```

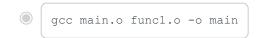
Which one lists the commands that are executed as a result of entering make on the Linux command line?

Hint: check file dates and determine which rules must execute because any file they depend upon has changed, and in which sequence the rules will execute to build the desired target.

#### orrect Answer

- make: `main' is up to date.
- gcc -c funcl.c
  gcc main.o funcl.o -o main
- gcc -c main.c
  gcc -c funcl.c
  gcc main.o funcl.o -o main

#### ou Answered



```
gcc -c main.c gcc main.o func1.o -o main
```

# **Question 8**

# What is the output of the program below when compiled using:

gcc main.c func.c

main.c	func.c
<pre>#include <stdio.h> void func(); static int x = 1; int y; static int z = 3; int main() {   func();   printf("%d\n", x + y + z);   return 0; }</stdio.h></pre>	<pre>int x = 1; static int y = 2; int z = 3;  void func(){   x = x + y;   y = 4 + z;   z = x + y; }</pre>

#### Correct!

4

0 13

Linker error

3

20

6

Quiz Score: 7 out of 8