

کد C اولی را در فایل code.c و کد c دومی را در فایل othercode.c ذخیره کردم.

Q1)

```
C code.c  X  M Makefile
C code.c
1  #include <linux/init.h>
2  #include <linux/kernel.h>
3  #include <linux/module.h>
4
5  int simple_init(void){
6      printk(KERN_INFO "Loading Module...\n");
7      return 0;
8  }
9
10 void simple_exit(void){
11     printk(KERN_INFO "Closing Module...\n");
12 }
13
14 module_init(simple_init);
15 module_exit(simple_exit);
16
17 MODULE_LICENSE("GPL");
18 MODULE_DESCRIPTION("Simple Module");
19 MODULE_AUTHOR("SGG");
20
21
```

```
C code.c  M Makefile  X
M Makefile
1  obj-m += code.o
2  all:
3      make -C /lib/modules/$(shell uname -r)/build M=$(shell pwd) modules
4  clean:
5      make -C /lib/modules/$(shell uname -r)/build M=$(shell pwd) clean
```

```
make[1]: Leaving directory '/usr/src/linux-headers-4.15.0-142-generic'
osoolian_99521073@99521073:~/Desktop/s11$ sudo make
make -C /lib/modules/4.15.0-142-generic/build M=/home/osoolian_99521073/Desktop/s11 modules
make[1]: Entering directory '/usr/src/linux-headers-4.15.0-142-generic'
CC [M] /home/osoolian_99521073/Desktop/s11/code.o
Building modules, stage 2.
MODPOST 1 modules
CC /home/osoolian_99521073/Desktop/s11/code.mod.o
LD [M] /home/osoolian_99521073/Desktop/s11/code.ko
make[1]: Leaving directory '/usr/src/linux-headers-4.15.0-142-generic'
osoolian_99521073@99521073:~/Desktop/s11$ ls
code.c  code.ko  code.mod.c  code.mod.o  code.o  Makefile  modules.order  Module.symvers
osoolian_99521073@99521073:~/Desktop/s11$
```

```
osoolian_99521073@99521073:~/Desktop/s11$ sudo insmod code.ko
osoolian_99521073@99521073:~/Desktop/s11$ lsmod
```

Module	Size	Used by
code	16384	0
nls_utf8	16384	1
isofs	45056	1
rfcomm	77824	0
bnep	20480	2
binfmt_misc	20480	1
snd_ens1371	28672	2
snd_ac97_codec	131072	1 snd_ens1371
gameport	16384	1 snd_ens1371
ac97_bus	16384	1 snd_ac97_codec
crct10dif_pclmul	16384	0
crc32_pclmul	16384	0
ghash_clmulni_intel	16384	0
pcbc	16384	0

```
an_99521073@99521073: ~/Desktop/s11
```

```
osoolian_99521073@99521073:~/Desktop/s11$ ls
code.c code.ko code.mod.c code.mod.o code.o Makefile modules.order Module.symvers
osoolian_99521073@99521073:~/Desktop/s11$ sudo dmesg -c
osoolian_99521073@99521073:~/Desktop/s11$ sudo insmod code.ko
osoolian_99521073@99521073:~/Desktop/s11$ dmesg
[ 1260.346026] Loading Module...
osoolian_99521073@99521073:~/Desktop/s11$ sudo rmmod code
osoolian_99521073@99521073:~/Desktop/s11$ dmesg
[ 1260.346026] Loading Module...
[ 1275.026790] Closing Module...
osoolian_99521073@99521073:~/Desktop/s11$
```

Q2)

```
code.c  Makefile  To direct input to this virtual machine, press Ctrl+G.
othercode.c
1  #include <linux/init.h>
2  #include <linux/kernel.h>
3  #include <linux/module.h>
4  #include <linux/list.h>
5  #include <linux/types.h>
6  #include <linux/slab.h>
7
8  struct birthday{
9      int day;
10     int month;
11     int year;
12     struct list_head list;
13 };
14
15 static LIST_HEAD(birthday_list);
16
17 int simple_init(void){
18     p1 = kmalloc(sizeof(*p1), GFP_KERNEL);
19     p1->day = 27;
20     p1->month = 3;
21     p1->year = 1382;
22     INIT_LIST_HEAD(&p1->list);
23     list_add_tail(&p1->list, &birthday_list);
24
25     p2 = kmalloc(sizeof(*p2), GFP_KERNEL);
26     p2->day = 26;
27     p2->month = 3;
28     p2->year = 1382;
29     INIT_LIST_HEAD(&p2->list);
30     list_add_tail(&p2->list, &birthday_list);
31
32     p3 = kmalloc(sizeof(*p3), GFP_KERNEL);
33     p3->day = 25;
34     p3->month = 3;
35     p3->year = 1382;
36     INIT_LIST_HEAD(&p3->list);
37     list_add_tail(&p3->list, &birthday_list);
38
39     p4 = kmalloc(sizeof(*p4), GFP_KERNEL);
```

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```
C code.c M Makefile C othercode.c X
C othercode.c
38
39     p4 = kmalloc(sizeof(*p4), GFP_KERNEL);
40     p4->day = 24;
41     p4->month = 3;
42     p4->year = 1382;
43     INIT_LIST_HEAD(&p4->list);
44     list_add_tail(&p4->list, &birthday_list);
45
46     p5 = kmalloc(sizeof(*p5), GFP_KERNEL);
47     p5->day = 23;
48     p5->month = 3;
49     p5->year = 1382;
50     INIT_LIST_HEAD(&p5->list);
51     list_add_tail(&p5->list, &birthday_list);
52
53     list_for_each_entry(ptr, &birthday_list, list){
54         printk(KERN_INFO "%d/%d/%d\n", ptr->day, ptr->month, ptr->year);
55     }
56
57     return 0;
58 }
59
60 void simple_exit(void){
61     struct birthday *ptr, *next;
62     printk(KERN_INFO "Removig Module Birthday...\n");
63     list_for_each_entry_safe(ptr, next, &birthday_list, list){
64         printk(KERN_INFO "Removing Birthday: %d/%d/%d\n", ptr->day, ptr->month, ptr->year);
65         list_del(&ptr->list);
66         kfree(ptr);
67     }
68 }
69
70 module_init(simple_init);
71 module_exit(simple_exit);
72
73 MODULE_LICENSE("GPL");
74 MODULE_DESCRIPTION("Simple Module");
75 MODULE_AUTHOR("SGG");
```

```
C code.c M Makefile X To direct input to this virtual machine, press Ctrl+G.
M Makefile
1 obj-m += othercode.o
2 all:
3     make -C /lib/modules/$(shell uname -r)/build M=$(shell pwd) modules
4 clean:
5     make -C /lib/modules/$(shell uname -r)/build M=$(shell pwd) clean
```

```
make: [gcc] Error 2
osoolian_99521073@99521073:~/Desktop/s11$ sudo make
make -C /lib/modules/4.15.0-142-generic/build M=/home/osoolian_99521073/Desktop/s11 modules
make[1]: Entering directory '/usr/src/linux-headers-4.15.0-142-generic'
CC [M] /home/osoolian_99521073/Desktop/s11/othercode.o
Building modules, stage 2.
MODPOST 1 modules
CC /home/osoolian_99521073/Desktop/s11/othercode.mod.o
LD [M] /home/osoolian_99521073/Desktop/s11/othercode.ko
make[1]: Leaving directory '/usr/src/linux-headers-4.15.0-142-generic'
osoolian_99521073@99521073:~/Desktop/s11$ ls
code.c  code.mod.c  code.o  modules.order  othercode.c  othercode.mod.c  othercode.o
code.ko  code.mod.o  Makefile  Module.symvers  othercode.ko  othercode.mod.o
osoolian_99521073@99521073:~/Desktop/s11$
```

```

make[1]: Leaving directory '/usr/src/linux-headers-4.15.0-142-generic'
osoolian_99521073@99521073:~/Desktop/s11$ ls
code.c  code.mod.c  code.o  modules.order  othercode.c  othercode.mod.c  othercode.o
code.ko  code.mod.o  Makefile  Module.symvers  othercode.ko  othercode.mod.o
osoolian_99521073@99521073:~/Desktop/s11$ sudo dmesg -c
[ 1260.346026] Loading Module...
[ 1275.026790] Closing Module...
osoolian_99521073@99521073:~/Desktop/s11$ sudo insmod othercode.ko
osoolian_99521073@99521073:~/Desktop/s11$ sudo dmesg
[ 2463.797705] Loading Module Birthday...
[ 2463.797707] 27/3/1382
[ 2463.797708] 26/3/1382
[ 2463.797708] 25/3/1382
[ 2463.797709] 24/3/1382
[ 2463.797709] 23/3/1382
osoolian_99521073@99521073:~/Desktop/s11$ lsmod
Module                  Size  Used by
othercode                16384  0
nls_utf8                 16384  1
isofs                   45056  1
rfcomm                  77824  0

```

```

osoolian_99521073@99521073:~/Desktop/s11$ sudo rmmod othercode
osoolian_99521073@99521073:~/Desktop/s11$ sudo dmesg
[ 2463.797705] Loading Module Birthday...
[ 2463.797707] 27/3/1382
[ 2463.797708] 26/3/1382
[ 2463.797708] 25/3/1382
[ 2463.797709] 24/3/1382
[ 2463.797709] 23/3/1382
[ 2520.804584] Removing Module Birthday...
[ 2520.804586] Removing Birthday: 27/3/1382
[ 2520.804587] Removing Birthday: 26/3/1382
[ 2520.804587] Removing Birthday: 25/3/1382
[ 2520.804588] Removing Birthday: 24/3/1382
[ 2520.804588] Removing Birthday: 23/3/1382
osoolian_99521073@99521073:~/Desktop/s11$ lsmod
Module                  Size  Used by
nls_utf8                 16384  1
isofs                   45056  1
rfcomm                  77824  0
bnep                    20480  2
binfmt_misc             20480  1
snd_ens1371             28672  2
snd_ac97_codec          131072  1 snd_ens1371
nls_utf8                 16384  1 snd_ens1371

```