Name: _____

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Programming in C **CS 240 - Spring 2018**

The work on this examination is to be your own and you are expected to adhere to the UMass-Boston honor system. All questions can be answered by one or two short sentences. Do not try to make up for a lack of understanding by providing a rambling answer.

Note: I give partial credit! Show all work!

1. (20 points)

Circle True(T) or False(F) for each question. If the question is not clear, write in your interpretation.

T or F	*(pa +1) is the same as *pa++
T or F	The compiler will flag a warning with the following: struct name{unsigned int data : 3;}; struct name flag; flag.data =8;
T or F	"I've at least started Homework 8."
T or F	65, 0x41, 0101, and 0b1000001 are all the same number in memory.
T or F	struct name {int a;}; struct name *p; The member of the struct is obtained by p.a
T or F	b = = (b^a^b);
T or F	Function pointer can be used to pass different function names to a function.
T or F	The word junk will get print out from the statement: system("echo junk");
T or F	The following statement is a valid definition: union junk{int a; char *b;}; union junk abc;

2. (20 points)

a. (10 points) Fill in the values. You can write &… for an address. If they are unknown , enter "NA". Assume the pointers get adjusted after evaluation.

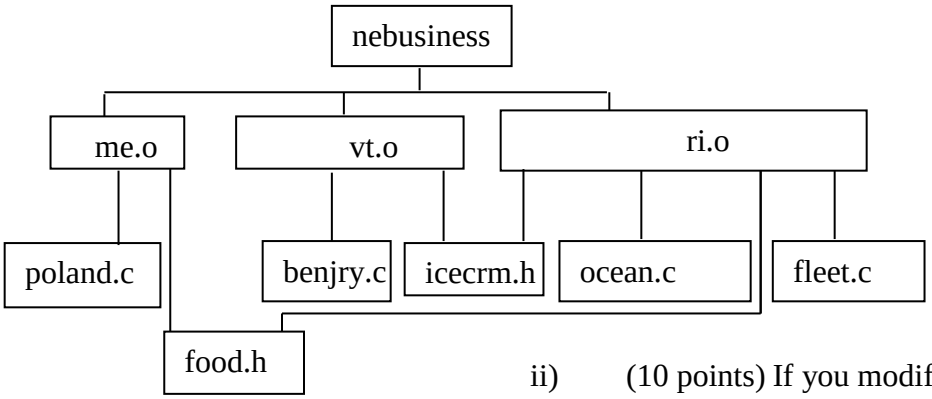
```
typedef struct {
      int   i;
      char  *str;} nstring;

nstring n[] ={{12, "Dec"},{2, "Feb"},{6, "Jun"},
              {1, "Jan"}, {10, "Oct"}};
nstring *np1, *np2;

np1 = n + n[1].i;/*points where? _____________*/

np2 = n + (n + 3)->i;/*points where? _________*/

printf("%d, %s\n", np1->i, np2->str);

        /*What prints? _____________________*/

printf("%d, %s\n", --np1->i, ++np2->str);

        /*What prints? _____________________*/

printf("%d, %s\n", (--np1)->i, (++np2)->str);

        /*What prints? _____________________*/
```

b. (10 Points) What is the output of the following code snippet?

```
char buffer[] = {3, 2, 1, 0, 4};
int x = 0, y = 0, i;
for (i = 0; i < 4; i++) {
     switch (buffer[i]) {
          case '0': x++;
          case '1': y++; break;
          case '2': x++;
          case '3': y+=2; break;
     }
     printf("(%d, %d) ", x, y);
}
```

(__, __) (__, __) (__, __) (__, __) (__, __)
1st print 2nd print 3rd print 4nd print 5th print

3. (20 points) makefile

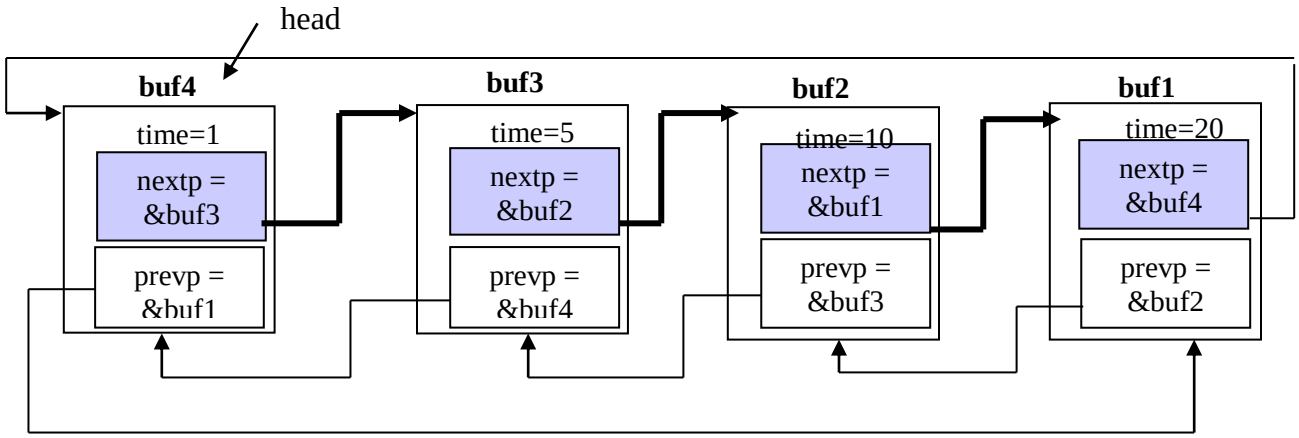


The dependency list of making nebusiness is shown in the above diagram.

i) (10 points) Write a makefile to make nebusiness.

ii) (10 points) If you modify the file food.h, and benjry.c files and re-make nebusiness, write down what make will do.

4.(40 points) Programming Question:



A priority queue structure is constructed using a linked list whose structure is defined as:

```
struct  link{
  int time;
  struct link * nextp;
  struct link * prevp;
};
struct link buf,buf1, buf2, buf3, buf4;
struct link * head_ptr= &buf4;
main(){
…
enque(head_ptr,  &buf);
…}
```

The order of the linked list is based on time. An example is shown in the above diagram. Write the enque() function that will queue the struct buf to the linked list according to increasing time. Show your pseudo code and C code.

```
static void enque(struct link * head, struct link *buf)
{…}
```

For your reference, a copy of enchain function from HW7 is provided:

```
static void enchain(struct blockl *p)
{
   struct blockl *holdp;/* temporary holder*/
   holdp = freep;      /* remember old block
                          at head of chain */
   freep = p;            /* place new block
                          on head of chain */

    /* update structures to place new block
       into chain    */
   if (holdp == NULL)  { /* free chain had
                         become empty */
     freep->nextp = freep;/* one block,
                         points to self */
     freep->prevp = freep; /* ditto */
     cursorp = freep;      /* and cursor pts
                           to this blk  */
   }
   else  {      /* old free chain non-empty*/
               /* insert on nextp list-- */
     freep->nextp = holdp; /* new block
                      points to old block */
     holdp->prevp->nextp = freep;
           /* end block points to new block*/
           /* and insert on prevp list--*/
     freep->prevp = holdp->prevp;
           /* new block points to end block*/
     holdp->prevp = freep;
           /* old block points to new block*/
   }
}
```

Answers:

1. F T F T F F T T T

2 a)

&n[2]
&n[1]
6, Feb
5, eb
2, Jun

b) (0, 2) (1, 4) (1, 5) (2, 6) (2, 6)

3
i)
```
nebusiness: me.o vt.o ri.o
      gcc me.o vt.o ri.o –o nebusiness

me.o: poland.c food.h
       gcc –c –o me.o poland.c

vt.o: benjry.c icecrm.h
      gcc –c –o vt.o benjry.c

ri.o: icecrm.h ocean.c food.h fleet.c
      gcc –c –o ri.o ocean.c fleet.c
```

ii)
```
gcc –c –o ri.o ocean.c fleet.c
gcc –c –o me.o poland.c
gcc vt.o  me.o   ri.o –o nebusiness
```

4.
```
/* Program to do priority Queue */
#include <stdio.h>
struct  link{
  int time;
  struct link * nextp;
  struct link * prevp;
};

void enqueue(struct link *, struct link *);

main()
{
  struct link buf1, buf2,buf3, buf4;
  struct link *head_ptr = &buf4, *now1,
*temp1=NULL;

/* initialize the first struct buf4 */
  buf4.time =1;
  buf4.nextp =&buf4 ;
  buf4.prevp = &buf4;

  for(now1= head_ptr; now1 !=temp1; now1=
  now1->nextp){
   temp1=head_ptr;
  printf("buf =%p  buf->time= %d, buf->nextp=%p,
buf->prevp=%p\n",now1, now1->time, now1->nextp,
now1->prevp);
  }
  printf("\n");

/* add 1st struct buf3 with buf3.time=5 */
  buf3.time =5;
  buf3.nextp=NULL;
  buf3.prevp=NULL;

  enqueue(head_ptr,&buf3);
  temp1=NULL;
  for(now1= head_ptr; now1 !=temp1; now1=now1-
>nextp){
   temp1=head_ptr;
  printf("buf =%p  buf->time= %d, buf->nextp=%p,
buf->prevp=%p\n",
        now1, now1->time, now1->nextp, now1-
>prevp);
  }
  printf("\n");


/* add 2nd struct buf1 with buf1.time=20 */
 buf1.time =20;
 buf1.nextp=NULL;
 buf1.prevp=NULL;

 enqueue(head_ptr,&buf1);
 temp1 = NULL;
  for(now1= head_ptr; now1 !=temp1; now1=now1-
>nextp){
   temp1=head_ptr;
  printf("buf =%p  buf->time= %d, buf->nextp=%p,
buf->prevp=%p\n",
        now1, now1->time, now1->nextp, now1-
>prevp);
```

```
  }
  printf("\n");

/* add 3rd struct buf1 with buf2.time=10 */
  buf2.time =10;
  buf2.nextp=NULL;
  buf2.prevp=NULL;

  enqueue(head_ptr,&buf2);
  temp1 = NULL;
  for(now1= head_ptr; now1 !=temp1; now1=
now1->nextp){
   temp1=head_ptr;
  printf("buf =%p  buf->time= %d, buf->nextp=%p,
buf->prevp=%p\n",now1, now1->time, now1->nextp,
now1->prevp);
  }
  printf("\n");

}


/* enqueue function according to time */
void enqueue(struct link * head, struct link *buf)
{
  struct link *now, *temp=NULL;

/* compare with the linked list members and if value
time is less, go to another member */

   for(now= head; now !=temp; now=now->nextp){
      temp=head;
      if(now->time > buf->time)break;
   }

   buf->nextp= now;
   buf->prevp= now->prevp;
   now->prevp = buf;
   buf->prevp->nextp = buf;

  return;
}
```