READ and complete the following:

- Bubble your Scantron only with a No. 2 pencil.

- On your Scantron (shown in the figure below), bubble:

  1. Your Name
  2. Your NetID
  3. Form letter "B"
  4. Bubble the corresponding 3-digit code (shown below) for your lab section on your Scantron.

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday</th>
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Five points will be deducted if a student does not correctly record their netid on the bubble sheet.

- No electronic devices, books, notes, or cheat sheets are allowed while taking this exam.

- Please fill in the most correct answer on the provided Scantron sheet.

- We will not answer any questions during the exam.

- Each question has only ONE correct answer.

- You must stop writing when time is called by the proctors.

  **No extra time will be given after the exam ends to fill in bubble sheets with answers.**

- Hand in both these exam pages and the Scantron.

- DO NOT turn this page UNTIL the proctor instructs you to.
1. Below is a list of common Unix system actions. Select the list of Unix commands that correspond with the four system actions.

1) Rename a directory 2) Navigate through directories 3) Print working directory 4) List the contents of a directory

(a) 1)rn 2)cd 3)print 4)list  
(b) 1)cd 2)mv 3)pwd 4)ls  
(c) 1)rename 2)cp 3)print 4)list  
(d) 1)mv 2)cd 3)pwd 4)ls

2. Which command do you type at the Unix prompt to view the contents of a file named mt2.c, assuming that this file is in your current directory?

(a) see mt2.c  
(b) peek mt2.c  
(c) more mt2.c  
(d) ls -la mt2.c

3. Which one of the following code fragments is likely to be a piece of machine code?

(a) 0111110000000100000000100000000000  
(b) x = x - y;  
(c) void main(void)  
(d) printf("%d", x);

4. Which of the following can be a valid name for a variable in a C program?

(a) x.1  
(b) x-1  
(c) 1x  
(d) x_1
5. Your current directory is your home directory, which contains the following items.

**Subdirectories:**
myfolder

**Files:**
myfile.c

Select the sequence of commands that, when entered at the Unix command line in the terminal window, will CREATE a new subdirectory named backup, then MOVE the file myfile.c into the subdirectory myfolder, and then COPY all of the contents of myfolder into the subdirectory backup, and then delete the myfolder and all of its contents.

(a) mkdir backup
   move myfile.c --> myfolder
   cp myfolder/myfile.c --> backup
   rm myfolder

(b) mkdir backup
   mv myfile.c myfolder
   cp myfolder/* backup
   rm -r myfolder

(c) mkdir backup
   mv myfolder myfile.c
   cp myfolder/ALL backup
   rm myfolder

(d) mkdir backup
   move myfile.c myfolder
   cp myfolder/* backup
   rm -r myfolder
6. Given the following Algorithm and incomplete C program shown below,

/* Algorithm */
   The function gets an integer from standard input device, adds one to it and then prints out the value to the standard output.
   */

#include <stdio.h>

void main (void)
{

    int a;
    double b;
    __________(blank 1)________________________
    b = a + 1.0;
    __________(blank 2)________________________
}

which pairs of C statements, after replacing (blank 1) and (blank 2) would correctly implement the algorithm described above?

(a) scanf("%i", &a); /* ( blank 1) */
    printf("The value of b is %d \n", &b); /* ( blank 2) */
(b) scanf("%i", &a); /* ( blank 1) */
    printf("The value of b is %i \n", b); /* ( blank 2) */
(c) scanf("%i", &a); /* ( blank 1) */
    printf("The value of b is %lf \n", b); /* ( blank 2) */
(d) scanf("%i", a); /* ( blank 1) */
    printf("The value of b is %c \n", &b); /* ( blank 2) */

7. Which one of the following statements is TRUE about the C language?

(a) Comments can be nested.
(b) Variable names in C are case-sensitive.
(c) The gcc compiler catches all run-time errors.
(d) The semicolon at the end of each line is optional.

8. Which one of the following C statements declares a char data-type variable named y and assigns it the character value 'x'?

(a) char y = x;
(b) char y = 'x';
(c) char y == 'x';
(d) x = char y;
9. The following C program compiles and runs without errors. What is the output the program produces? When the program is run and the user is asked "What day is today?", the user inputs the integer value 3 and the second time the user is asked "What day is today?", the user inputs 6.

```c
#include <stdio.h>

void main(void)
{
    int dayOfWeek;

    do{
        printf("What day is today?\n");
        scanf("%i", &dayOfWeek);

        switch (dayOfWeek)
        {
            case 5:
                printf("Party!\n");
                break;
            case 1 ... 4:
                printf("Do homework.\n");
                break;
            default:
                printf("Sleep all day.\n");
        }
    }while(dayOfWeek != 6);
}
```

(a) Do homework.
    Sleep all day.
    Sleep all day.

(b) Do homework.
    Sleep all day.

(c) Do homework.
    Sleep all day.
    Do homework.
    Sleep all day.

(d) Sleep all day.
    Sleep all day.
The following C program compiles and runs without errors. What is the output of the program provided the user inputs the integer values 5 and 4 respectively, when asked to enter the day of week and the hour?

```c
#include <stdio.h>

void main(void)
{
    int dayOfWeek, hour;

    printf("Please enter the day of week and current hour.\n");
    scanf("%i %i", &dayOfWeek, &hour);

    if ((dayOfWeek >= 1) && (dayOfWeek <= 5))
    {
        if (hour <= 7)
            printf("Sleeping.\n");
        if (hour < 17)
            printf("At School.\n");
        else
            printf("Do home work.\n");
    }

    if ((dayOfWeek == 6) || (dayOfWeek == 5))
        printf("Stay at home all day.\n");
}
```

(a) At School.
(b) Sleeping.
(c) Sleeping.At School.
(d) Sleeping.At School.Stay at home all day.
The following C program compiles and runs without errors. What is the output of the program? Hint: Be careful, the code indentation may be misleading.

```c
#include <stdio.h>

void main(void)
{
    int num = 99, r = 0;

    switch (num % 3)
    {
        case 0:
            printf("This is case 0.");
            r = 0;
            break;
        case 1:
            printf("This is case 1.");
            r = 1;
            break;
        default:
            printf("This is case 2.");
            r = 2;
    }

    if (r == 0)
        printf("The remainder is 0.");
    printf("This num is exactly divisible by 3.");
}
```

(a) This is case 2. The remainder is 0. This num is exactly divisible by 3.
(b) This is case 2. This num is exactly divisible by 3.
(c) This is case 2.
(d) This is case 0. The remainder is 0. This num is exactly divisible by 3.
12. The following C program compiles and runs without errors. What is the output of the program provided the user inputs the integer value 3 when asked to enter the day of week?

```c
#include <stdio.h>

void main(void)
{
    int dayOfWeek = 0;

    printf("What day is today?\n");
    scanf("%i", &dayOfWeek);

    if ((dayOfWeek >= 1) && (dayOfWeek <= 5))
        printf("Weekday. Nay.");
    if ((dayOfWeek != 6) || (dayOfWeek == 7))
        printf("Weekend! Yay!!");
}
```

(a) Weekday. Nay. Weekend! Yay!!
(b) There is no output.
(c) Weekend! Yay!!
(d) Weekday. Nay.

13. The following C program compiles and runs without errors. What is the output of the program?

```c
#include <stdio.h>

void main(void)
{
    int i,j;

    for(i=1 ; i<4 ; i++)
    {
        for(j=1 ; j<i ; j++)
            printf("%i,",i*j);
    }
}
```

(a) 1, 2, 3,
(b) 0, 1, 2,
(c) 2, 3, 6,
(d) 0, 0, 0, 0, 1, 2, 0, 2, 4,
Which of the following programs contains an infinite loop?

(a) #include <stdio.h>

    void main(void)
    {
        int i=1;
        do
            i=i+5;
            while(i<100);
    }

(b) #include <stdio.h>

    void main(void)
    {
        while(0)
            printf("infinite?");
    }

(c) #include <stdio.h>

    void main(void)
    {
        int i,total;
        for(i=0;i<100;++i)
            total = total + i--;
    }

(d) #include <stdio.h>

    void main(void)
    {
        int i;
        for(i=100;i>0;)
        {
            i--;
        }
    }
15. The following C program compiles and runs without errors. What is the output of the program?

```c
#include <stdio.h>

void main(void)
{
    int i;
    int arr[] = {1, 3, 6, 9, 13, 17};

    for(i=0;i<5;i++)
    {
        printf("%i ",arr[i+1]-arr[i]);
    }
}
```

(a) 0 1 2 3
(b) 2 3 3 4 4
(c) 2 3 3 4
(d) 3 3 4 4

16. The following C program compiles and runs without errors. What is the output of the program?

```c
#include <stdio.h>

void main(void)
{
    int i = 1;
    int first = 1;
    int second = 1;
    int current;

    while(i<4)
    {
        i++;
        current = first+second;
        first = second;
        second = current;
    }

    printf("%i",current);
}
```

(a) 3
(b) 4
(c) 5
(d) 6
17. Which of the following programs will generate the output exactly as shown below?

1 2 3

(a) #include <stdio.h>

    void main(void)
    {
        int i=3;
        do
            printf(" %i ",4-i);
        while(--i);
    }

(b) #include <stdio.h>

    void main(void)
    {
        int i;
        for(i=0;i<=3;i=i+1)
            printf(" %i ",i);
    }

(c) #include <stdio.h>

    void main(void)
    {
        int i=3;
        do
            printf(" %i ",4-i);
        while(i--);
    }

(d) #include <stdio.h>

    void main(void)
    {
        int i=0;
        while(i<3)
            printf(" %i ",i++);
    }
18. What is the exact output produced by the following C program that is saved in a file named read.c?

```c
#include <stdio.h>

void main(void)
{
    char c;
    int Total;
    int counter=1;

    scanf("%i", &Total);

    while( (EOF!=scanf("%c", &c)) && (counter<=Total) )
    {
        printf("%c ",c);
        counter++;
    }
}
```

The program is compiled and run without errors by typing the following commands at the Unix prompt,

```
[user@linux5 ]$ gcc read.c
[user@linux5 ]$ ./a.out < data
```

where the file named data contains the following values,

3abcdef

(a) a 

(b) a b c

(c) 2 a b

(d) a b
19. The following C program is saved in a file named string.c

```c
#include <stdio.h>
#include <string.h>

void main(void)
{
    char string[] = "madame";
    int i, size = strlen(string);

    for (i = 0; i < size/2; i++)
        if(string[i] != string[size-i-1])
            break;

    if(i == size/2)
        printf("Yes");
    else
        printf("No");
}
```

At the Unix prompt what are the results when we try to enter the following commands?

```
[user@linux5 ]$ gcc string.c
[user@linux5 ]$ ./a.out
```

(a) Yes  
(b) No  
(c) Compilation error  
(d) Runtime error

20. Assume we have written a function named myfunc as defined below.

```c
int myfunc(int x[], int y)
{
    return x[0] + y;
}
```

Which one of the following is a valid prototype for the function myfunc?

(a) return x[0] + y;  
(b) int myfunc(int a, int b);  
(c) int myfunc(int [], int b);  
(d) int myfunc(int a, int b[]);
21. The following C program compiles and runs without errors. What is the output of the program?

```c
#include <stdio.h>

void main(void)
{
    int c[3]={5,10,20};
    int i=0;
    c[0] += 5;
    printf("%i\n",c[i++]);
    printf("%i",c[++i]);
}
```

(a) 15
    30
(b) 15
    20
(c) 10
    30
(d) 10
    20

22. The following C program compiles and runs without errors. What is the output of the program?

```c
#include <stdio.h>
#include <string.h>

void main(void)
{
    char flip[] = "answer";
    char flop[] = "holder";
    int length = strlen(flip);
    int i;
    for(i=0;i<length;i++)
        flop[length-i]=flip[i];
    printf("%s",flop);
}
```

(a) answer
(b) holder
(c) rewsna
(d) hrewsna
23. Which initialization of a five row by five column 2-dimensional C array named arr does NOT produce the desired output below?

The output produced is:  1  2  3  4  5

```c
#include <stdio.h>

void main(void)
{
    int i;

    __________________________ /*your code goes here*/
    arr[1][1]=2;
    arr[2][2]=3;
    arr[3][3]=4;
    arr[4][4]=5;

    for(i = 0; i < 5; ++i)
    
        printf("%i ", arr[i][i]);
}

(a) int arr[][5] = {1,3,5,7,9};
(b) int arr[5][5] = {1,3,5,7,9};
(c) int arr[5][] = {1,3,5,7,9};
(d) int arr[5][5] = {1,3,5,7};
```

24. The following C program compiles and runs without errors. What is the output of the program?

```c
#include <stdio.h>
#include <string.h>

void main(void)
{

    char var[] = {'f','r','o','','\0','g','','\0'};

    printf("%i, ", strlen(var));
    strcpy(var, "frog");
    printf("%i", strcmp(var, "frog"));
}

(a) 3, 0
(b) 4, 0
(c) 5, 0
(d) 4, -1
```
25. The following program will compile and run without errors. What is its output?

```
#include <stdio.h>

void func2(int u[], int v[], int c[])
{
    int d[3] = {v[0],v[1],v[2]};
    int a = c[0], b = d[0];

    c[0] = c[2];
    c[2] = a;

    d[0] = d[1];
    d[1] = b;

    b = v[0];
    v[0] = v[1];
    v[1] = b;
}

void func1(int c[], int a[], int b[])
{
    func2(c,b,a);
}

void main(void)
{
    int a[3] = {1,2,3};
    int b[3] = {4,5,6};
    int c[3] = {7,8,9};

    func1(a,b,c);

    printf("{%i,%i,%i} \n",a[0],a[1],a[2]);
    printf("{%i,%i,%i} \n",b[0],b[1],b[2]);
    printf("{%i,%i,%i} \n",c[0],c[1],c[2]);
}
```

(a) {1,2,3} {6,5,4} {8,7,9}
(b) {1,2,3} {4,5,6} {7,8,9}
(c) {2,1,3} {6,5,4} {7,8,9}
(d) {1,2,3} {4,5,6} {9,8,7}
Extra Credit

Answering the question below correctly will add points to your exam total. Answering incorrectly or not answering will not add points to your exam total.

26. What would happen if you were to attempt to compile (with the gcc compiler) and run the following C program?

```c
#include <stdio.h>

void func(char arr1[]);

void main(void)
{
    char word[] = "ABCDEFG"
    func(word);
}

void func(char arr[])
{
    int i = 0;

    do
    {
        if(arr[i] == '\0')
            return;

        printf("%c ",arr[i]);
        ++i;
    } while(1);

    printf("string successfully printed \n");
}
```

(a) The program would compile and run without error and output:

```
A B C D E F G
```

(b) The program would compile and run without error and output:

```
A B C D E F G string successfully printed
```

(c) The program would compile without error and output:

```
A B C D E F G
```

and then enter into an infinite loop printing out garbage values.

(d) A compile error would occur since '\0' is not a valid character in the C programming language.