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>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00-10:50</td>
<td>101</td>
<td>104</td>
<td>108</td>
<td>111</td>
</tr>
<tr>
<td>11:00-12:50</td>
<td>102</td>
<td>105</td>
<td>109</td>
<td>112</td>
</tr>
<tr>
<td>1:00-2:50</td>
<td>106</td>
<td></td>
<td>113</td>
<td></td>
</tr>
<tr>
<td>3:00-4:50</td>
<td>103</td>
<td>107</td>
<td>110</td>
<td>114</td>
</tr>
</tbody>
</table>

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.
(This page intentionally left blank.)
1. Suppose that your current working directory is named `mps`, and that your home directory is named `cs101stu`. Which of the following Unix commands let you move all C programming files from the `cs101stu` directory into the `labs` directory.

(a) `mv ?.c /home/cs101stu/labs`
(b) `mv cs101stu/*/c labs`
(c) `mv .//*.c /home/cs101stu/labs`
(d) `mv ..//*.c ../labs`

2. Which one of the following commands creates a directory named `lab6` when entered at the Unix prompt?

(a) `mkdir lab 6`
(b) `mkdir lab6`
(c) `cd lab_6`
(d) `make dir lab6`

3. Which command do you type at the Unix prompt to view the contents of a file named `MT1.m`, assuming that this file is in your current directory?

(a) `see MT1.m`
(b) `view MT1.m`
(c) `ls -la MT1.m`
(d) `more MT1.m`
4. Which one of the following statements is TRUE about comments in C?

(a) Comments can be inserted only at the beginning of the code.

(b) A comment can cover several lines in the editor.

(c) Nested comments are accepted.

(d) Only one comment can be written within a block of code.

5. Which one of the following statements declares an integer variable named $x$ and assigns it the value 6?

(a) int $x$=6;

(b) int $x$;
    $x$=6;

(c) int $x$=6;

(d) #define $x$ 6

6. A pictorial representation of the flow of a program is also known as ————.

(a) Flowchart

(b) Pseudo-code

(c) Block

(d) Preprocessor Directive
7. The following C program compiles and runs without errors. What is the output of the program?

```c
#include <stdio.h>

void main(void)
{
    int x = 1;
    int y = 1;

    if(x!=y);
    printf("A ");
    if(x>=y)
    printf("B ");
    else
    printf("C ");
}
```

(a) A B  
(b) A C  
(c) B  
(d) C  

8. Select the statement which will correctly display the value of a variable x with 4 digits on both sides of the decimal point.

```c
double x = 1.23456789e3;

(a) printf(" %9.4i \n", x);
(b) printf(" %9.4lf \n", x);
(c) printf(" %8.4i \n", x);
(d) printf(" %9.4d \n",x);
```
9. The following C program compiles and runs without errors. What is the output of the program provided the user inputs the character value s when asked to enter the league?

```c
#include <stdio.h>

void main(void)
{
    char league;
    int team = 3;

    printf(" Enter the league -> English(e)/Spanish(s) : ");
    scanf("%c", &league);

    if(league == 's')
    {
        switch(team)
        {
            case 1: printf(" Barcelona ");
                  break;
            case 2: printf(" Real Madrid");
            default: printf(" Valencia");
        }
    } else if(league == 'e')
    {
        switch(team)
        {
            case 2: printf("Liverpool");
            case 3: printf("Chelsea");
            default: printf("Manchester United");
        }
    }
    printf("\n");
}
```

(a) Real Madrid

(b) Barcelona

(c) Valencia

(d) Chelsea
10. The following C program compiles and runs without errors. What is the output of the program?

```c
#include <stdio.h>

void main(void)
{
    int p, q, r = 0;
    
    p = 2;
    q = 1;
    
    if ( p < 1 || q > 2)
        r = 4;
    else if (p >= 1 && q > 2)
        r = 6;
        else if (p >= 1 && q >= 2)
            r = 8;
    
    printf(" %i ", r);
}

(a) 0
(b) 4
(c) 6
(d) 8
11. The following C program does not compile without errors. There is a syntax error in the program. What change would fix the syntax error?

```c
#include <stdio.h>

void main(void)
{
    int a,b;
    a = 4;
    b = 5;

    if(b>a) /* if true, reassign b and also print the new value */
        b=a;
    printf("new value of b is ");
    else
        a=b;
}
```

(a) There should be a semicolon immediately after `if(b>a)`.

(b) Change the `printf` to actually print the new value of `b`.

(c) There are missing braces `{ }` between the `if` and `else`.

(d) A `scanf` is missing.
12. Which of the following programs does not contain an infinite loop?

(a) #include <stdio.h>

    void main(void)
    {
        int x=0;

        while(5)
            x=x+1;
    }

(b) #include <stdio.h>

    void main(void)
    {
        int i,total;

        for(i=0,total=1;i<total;i=i-1,total=total+1)
        {
            i++;
            --total;
        }
    }

(c) #include <stdio.h>

    void main(void)
    {
        int i=1;

        do
            i=i+1;
        while(i--);
    }

(d) #include <stdio.h>

    void main(void)
    {
        int i,total;

        for(i=100; ;i--)
            if(!i)
                break;
    }
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<=3; i=i+1)
    {
        j=1;
        do
        {
            printf(" ");
            j++;
        }while(j<=i);

        printf("%i\n", j);
    }
}

(a) 3
(b) 1
    2
    3
(c) 2
    3
    4
(d) 1
    2
    3
14. Which of the following programs will generate the output given below?

1 2 3

(a) #include <stdio.h>

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

(b) #include <stdio.h>

void main(void)
{
    int i=3;

do
    printf(" %i ",4-i);
    while(--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++);
}
15. What is the 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,

5abcdef

(a) a b c d e
(b) 5 a b c d e
(c) a b c d e f g h
(d) 5 a b c d e f g h
16. The following C program is saved in a file named array.c

```c
#include <stdio.h>

void main(void)
{
    int arr[][3]={{1,2},{3,4,5},{5}};

    printf("%i %i %i",arr[0][2],arr[1][2],arr[2][2]);
}
```

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

```
[user@linux5 ]$ gcc array.c
[user@linux5 ]$ ./a.out
(a) 2 4 0
(b) 0 5 0
(c) 3 4 5
(d) Compilation error
```

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

```c
#include <stdio.h>

void main(void)
{
    int i;
    int arr[] = {0 , 2 , 4, 6, 8, 10};

    for (i=0 ; i < 4 ; ++i)
    {
        printf(" %i ", arr[i]++);
        printf(" %i ", arr[++i]);
    }
}
```

```
(a) 0 2 4 6
(b) 0 4 6 10
(c) 0 2 4 6 8
(d) 0 2 4 6 8 10
```
18. The following C program is saved in a file named string.c

```c
#include <stdio.h>

void main(void)
{
    int size = 0, i = 0;
    char string[] = "malayalam";

    while(string[size] != '\0')
        size++;

    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?

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

(a) No

(b) Yes

(c) Compilation error

(d) Runtime error
19. Which of the following is an **illegal** array declaration in C?

(a) double x[2][3];
(b) float array[10] = {2.1, 3.4};
(c) char words[8];
(d) int matrix[4][] = {{1, 2, 3}, {4,5},{7},{10, 11, 12}};

20. Which of the following is a **VALID** prototype for the function `output` whose definition is shown below?

```c
void output(int x, int y[], char s)
{
    printf("File number %i-%i%i%i%i-%c",x,y[0],y[1],y[2],y[3],s);
}
```

(a) void output(int, int, char);
(b) output(int x, int y[], char s);
(c) void output(int, int [], char);
(d) void output(int, [], char );
21. The following C program will compile and run without errors. What output does it produce?

```c
#include <stdio.h>

int worker2(int x, float pay)
{
    if(pay > 50.00)
        return (4*x);
    return (x);
}

int worker1(int x, float pay)
{
    int y;
    y = worker2(x, pay-30.00);
    if(y == 4*x)
    {
        printf("Job Complete, here you go! \n");
        return y;
    }
    return (2*y);
}

void main(void)
{
    int x = 6;
    int product;
    float pay = 60.00;
    product = worker1(x, pay);
    printf("%i \n", product);
}
```

(a) Job Complete, here you go! 12
(b) 3
(c) 6
(d) 12
The following C program compiles and runs without errors. What output does it produce?

```c
#include <stdio.h>

void something(int arr[]) {
    int temp;
    int x = arr[5];
    int y = arr[6];

    temp = arr[1];
    arr[1] = arr[0];
    arr[0] = temp;

    temp = x;
    x = y;
    y = temp;
}

void main(void) {
    int i;
    int arr[] = {6, 8, 7, 5, 0, 3, 9};

    something(arr);

    for(i = 0; i < 7; ++i)
        printf("%i ", arr[i]);

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

(a) 8 6 7 5 0 3 9  
(b) 8 6 7 5 3 0 9  
(c) 6 8 7 5 3 9 0  
(d) 8 6 7 5 3 9 0
23. The following C program compiles and runs without errors. What output does it produce?

```c
#include <stdio.h>

void increase_val(int a)
{
    a = a + 1;
    return;
}

void increase_ref(int y[])
{
    y[0] = y[0] + 1;
    return;
}

void main(void)
{
    int a = 2;
    int b[1] = {5};

    switch(a)
    {
    case 3: increase_val(a);
    case 4: increase_ref(b);
    default: a = a + 1;
    }

    printf("%i %i \n", a, b[0]);
    return;
}
```

(a) 3 5
(b) 3 6
(c) 4 5
(d) 4 6
24. Which of the following functions does NOT return an integer of value 5?

(a) int function(void)
    {
        double y = 5;
        return y;
    }

(b) int function(void)
    {
        int a = 4;
        return ++a;
    }

(c) int function(void)
    {
        int i = 7;
        if( i < 5)
            return -5;
        else
            return 5;
    }

(d) double function(void)
    {
        int x = 5;
        return x;
    }
25. Which of the following function calls will print 21 when the program is compiled and run?

```c
#include <stdio.h>

int add(int arr1[], int arr2[], int length)
{
    int i, s;
    int sum = 0;

    for(i = 0; i < length; i++)
        arr1[i] = arr1[i] + arr2[i];
    for(s = 0; s < length; s++)
        sum = sum + arr1[s];
    return sum;
}

void main(void)
{
    int size = 3;
    int numbers1[3] = {2, 4, 6};
    int numbers2[3] = {1, 3, 5};
    int x;
    ______function call_______
    printf("%i", x);
    return;
}

(a) x = add(int numbers1[3], int numbers2[3], size);
(b) x = add(numbers1[3], numbers2[3], size);
(c) x = add(numbers1, numbers2, size);
(d) x = add(numbers1, numbers2);
```
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. The following C program compiles and runs without errors. What output does it produce?

```c
#include <stdio.h>

void follow2(int x[], int y)
{
    int temp, i, j = 0;
    for(i = y/2-1; i>=0; --i)
    {
        temp = x[i];
        x[i] = x[i+1+j];
        x[i+1+j] = temp;
        j = j + 2;
    }
}

void follow1(int arr1[], int arr2[], int container[], int size)
{
    int i,k = 0;
    for(i = 0; i<size; ++i)
    {
        container[i] = arr1[i];
        container[i+size] = arr2[i];
        ++k;
    }
    size = size + k;
    follow2(container, size);
}

void main(void)
{
    int a[] = {1,4,5};
    int b[] = {7,10,11};
    int c[6];
    int i, d = 3;
    follow1(a, b, c, d);
    for(i = 0; i<2*d; ++i)
    {
        printf("%i \n");
    }
}
```

(a) 1 4 5 7 10 11
(b) 1 4 7 5 10 11
(c) 1 10 7 5 4 11
(d) 11 10 7 5 4 1