Section A

MCQs **[2x10=20]**

a)

```
int a=8, b=6;
printf("%d\n", (a|(b>>2))&(b|(a<<2))  );
```

This code snippet will print: **a> 0** b> 1 c> 2 d> 4

b)

If you compile and run the following code what should happen?

```
int f(int a){
   if(!a){}
}

int main()
{
   printf("%c\n", f(0)  );
   return 0;
}
```

a> It should not compile
b> It should compile with warning and then print (null)
c> No error or warning but it will run and print nothing.
d> No error or warning but it will run and print W

c)

Which of the following statements is/are incorrect?
A. General purpose registers cannot be accessed with C
B. Enum cannot be used for inverse mapping of multiple string data
C. One needs to call system headers even if she calls a custom header that calls system headers

a> A. b> A,B **c> B,C** d> A,B,C

d)

You have to keep the weights of students (assume they are expressed as natural numbers only) according to their roll numbers which are just incremental in nature. It should be done in such a way that by knowing the roll number her weight can be retrieved and vice versa. What data type can you go for?

a> integer array

b> enum
c> any of a and b can be used
d> there is no way to meet all requirements.

e)
The following code should return?

```
#include <stdio.h>
#include <limits.h>

float sum(float a,float r){
   int counter=0;
   float sum=a;
   while((counter++)<INT_MAX)
      sum+=a=a*r;
   return sum;
}
int main()
{
   float a=4,r=0.5;
   printf("%f\n", sum(a,r));
   return 0;
}
```

a> 5 **b> 8** c> 10 d> 7

f) Find the output

```
int i = 11;
      switch (i) {
      case 013: printf("Hello");
            break;
      case 011: printf("World");
            break;
      default: printf("Mickey");}
```

a) Hello
b) World
c) Mickey
d) Syntax error

g) What output would the following code print

```
#include <stdio.h>
int main()
{
        int i;
        i = 12, 10, 11;
   printf("%d", i);
        return 0;
```

}
a> 12
b> 10
c> 11
d> Invalid Syntax

h) What output would the following code print

```
 #include <stdio.h>                                  1
int main()
{
    int a=121;
    printf("*%06d*",a);

}
```

What will be the output
a> *000121*
b>*0121*
c>*000000121*
d> *121*

i) What output would the following code print

```
#include <stdio.h>
int main()
{
        char a = 012;

        printf("%d", a);

        return 0;
}
```

a> 60
b>12
c>012
d>10

j) What output would the following code print

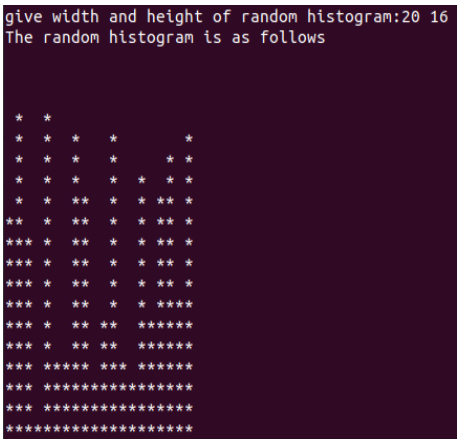
```
#include <stdio.h>
int main()
{
        char a = '012';

    printf("%d", a);

        return 0;
}
```

a> Compile error
b> **Print nothing**
c>12
d>10

Section B

Question 1 (20 marks)

Generate a random histogram with 0 to max ranged numbers over n entries, max and n should be taken from users (restrict them to 40 and 60 respectively). Print the histogram with stars and zero should print 1 star and 1 should print 2 and so on. A demo run is as follows:



Hint : include <stdlib.h> to call rand() and use it as rand()%(max + 1); to get a number between 0 and max randomly.

Solution:

```
#include <stdio.h>
#include <stdlib.h>

int main()
{
    int n,max;
    printf("give width and height of random histogram:");
    scanf("%d %d",&n,&max);
    int a[n];
    printf("The random histogram is as follows\n\n\n");

    for(int i=0;i<n;i++)
        a[i]= rand()%(max + 1);

    char buffer[max+1][n];
    for(int i=0;i<n;i++){
        for(int j=0;j<(max-a[i]);j++)
            buffer[j][i]=' ';
        for(int j=(max-a[i]);j<(max+1);j++)
```

```
            buffer[j][i]='*';
    }

    for(int i=0;i<(max+1);i++){
        for(int j=0;j<n;j++)
            printf("%c",buffer[i][j]);

        printf("\n");
    }


    return 0;
}
```

Question 2 (20 marks)

You are sending boxes through a channel in which each box is three dimensional. It is defined by its length, width and height.
The width and height of the channel is 100 cm and the length is infinite. A box can be sent into a channel only if the height is less than the height of the channel and width is less than the width of the channel. Find the volume of each box which can be transported without any problem to the other end of the tunnel. If any conditions are not met print condition <number> failed. The box can be rotated so that the new height, width would fit in the channel.
Input format:
The first line contains a single integer, denoting the number of boxes.
Lines follow with three integers on each separated by single spaces length, width and height which are length, width and height in cm of the box.
Conditions:
1<=n<=100
1<=width, height<=100

```c
#include <stdio.h>
int main()
{
    int l[100],h[100],w[100];
    int n,i, volume;
    printf("Please enter n: ");
    scanf("%d",&n );
    if(n<=100 && n>=1){

    for (i=0;i<n;i++){
        printf("\nPlease enter length width height\n");
        scanf("%d %d %d",&l[i],&w[i],&h[i]);
        int count=0;
        if (l[i]<=100)
        count++;
        if (w[i]<=100)
        count++;
        if (h[i]<=100)
        count++;
        if(count>=2){
            volume=l[i]*w[i]*h[i];
            printf("%d\n",volume);
        }
        else{
            printf("Condition 2 failed");
        }
    }
    }
    else{
        printf("Condition 1 failed");
    }

    return 0;
}
```

Section C

Question 1: **[10 marks]**

Let N be a positive integer with distinct digits. Write an algorithm to find the largest two-digit number formed by using the digits in N.

Examples:

If N=253816, the largest two-digit number is 86.

If N=42687913, the largest two-digit number is 98.

Solution: Algorithm:
Input: A positive integer N;
Output: The largest two-digit integer formed by the digits of N.

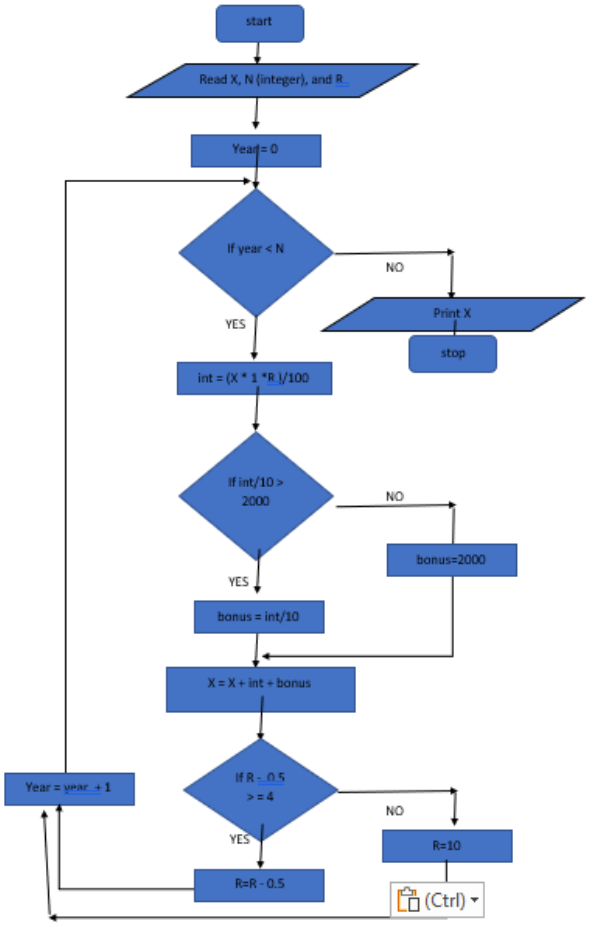
Step 1: max1=0, max2=0; // max1 stores the largest digit in N, max2 stores the second largest digit in N when we move left to right in N.
Step 2: if (N < 10)
Print We cannot find a two digit number
Step 3: else
3.1 while(N!=0)
3.12 rem = N %10
3.13 N = N%10
3.14 If rem > max1
3.141 max2=max1
3.142 max1=rem
3.15 Else if rem < max1 and rem > max2
3.151 max2 = rem
end while
end else
Step 4: Print The number is max1*10 + max2

Question 2: **[10 marks]**

Draw a flow chart for the following problem:
A person wants to do a fixed deposit of an amount of Rs. X in a bank for N number of years. The bank offers simple interest at the rate of R % per year (assume R is greater than 4). After every year, the bank computes the interest obtained by the customer. Further, the bank reduces the interest rate by 0.5% per year after every year with a lower bound of 4% per year. Also, every year the bank offers the customer a bonus amount, which is the maximum of Rs. 2000 and 10 % of the interest obtained in that year. The next year's principal amount is the sum of the principal amount in the previous year, interest earned in the previous year, and the previous year's bonus amount.

Compute the total amount the customer gets after N years. Read X, N, and R from the user.

Solution:



Question 3: **[10 marks]**

Convert the following

a) $(12.2)_8$ to base 10
b) $(1010.01)_2$ to base 10
c) $(C1)_{16}$ to base 8
d) $A2B_{16}$ to base 2

Solution:

a) $(10.25)_{10}$
b) $(10.25)_{10}$
c) 301_8
d) 1010 0010 1011