Que 1 [2M]

This question has been divided into two in mooKIT.

(a) [T/F] string array s has been initialized with “IITK2021” and then command str[4]=’\0’ is executed. The size of s is 4 bytes.

Ans: False

(b) char s[]="IITK";
printf("%c",s);
The expected output will be “I”.

Ans: False

Que 2 [1M]

Which of the following are valid variable names in C? (More than one may be correct)

A. _var1

B. 1_var

C. var_1

D. *var_1

Ans : A, C

Que3 (T/F) [1M]

Let a be any integer and b = 0, then the expression if ((a%2) || (!(a%2)) || (a/b)) will give a division by zero error.

Ans: False

Que 5 [3M] : Find the Input Array

You are given the output of the following program. Find the corresponding input array.

Output : 3 11 5 11 4

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

Answer : 3 11 5 11 4

Que 6 [2M] Suppose you are given three numbers a,b,c. You want to find the minimum of these 3 numbers. A simple algorithm would be to first compute the minimum of two numbers (MinTwo). Now compute the minimum of three numbers (MinThree) by taking the minimum of the third number and MinTwo. It can be easily verified that MinThree would be the minimum of a,b,c.

You are given the pseudocode for the algorithm described above, fill in the missing blanks B1, B2, B3, B4, B5

1. input a,b,c
2. If a < **(B1)** , then **(B2)** = a
3. Else **(B3)** = **(B4)**
4. If MinTwo < b , then MinThree = MinTwo
5. Else MinThree = **(B5)**
6. Print MinThree

ANSWER: B1 = c B2 = MinTwo B3 = MinTwo B4 = c B5 = b

Que 7 [1M] (T/F) Not passing arguments to a function defined as int foo(int a) in the caller program will give a compilation error.

Answer: True

Que 8 [1M]

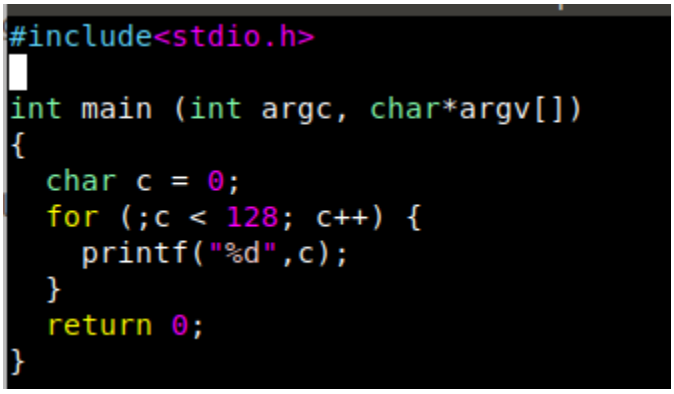
``` The correct order of operator evaluation for the given expression: (1 mark) a = b / c << d + ~e % f && g - h || i <= j | k ```

1. ~ / % + - << <= | && || =
2. ~ / % << - + <= | || && =
3. = / % + - ~ << <= | && ||
4. / ~ % + - << <= | && || =

Answer: 1

Que 9 [2M]

Output of the given snippet:(2 Marks)



```c
#include<stdio.h>

int main (int argc, char*argv[])
{
  char c = 0;
  for (;c < 128; c++) {
    printf("%d",c);
  }
  return 0;
}
```

1. 0 1 2 3 4 127
2. Compilation error
3. Infinite loop
4. Runtime error

Answer: 3
```

Que 10 [2M]

What is the output of the following program?

```c
int main()
{
    int i = 0, j = 3;
    for (i = 0; i < j; i++)
    {
        for (int k = 0; k <= i; k++);
        {
            printf("%d %d ", i, k);
        }
        printf("\n");
    }
    return 0;
}
```

(i)

0 1

1 1 2 2

(ii)

0 0

1 0 1 1

(iii)

0 0

1 0 1 1

2 0 2 1 2 2

(iv) compile error

Answer: (iv)

Que 11 [1*3 = 3M]: This question is divided into 3 questions of 1M in MooKIT.

Give the output of the following snippets, or indicate error with a short explanation:

1.
```
int a=1, b=2, c=3, d=4;
a = b = c = d == 4;
printf("%d %d %d %d", a, b, c, d);
```
int a=1, b=2, c=3, d=4;
a = b = c = d == 4;
printf("%d %d %d %d", a, b, c, d);

Output: 1 1 1 4

2.
```
int a=1, b=2, c=3, d=4;
(a = b) + c;
printf("%d %d %d %d", a, b, c, d);
```
int a=1, b=2, c=3, d=4;
(a = b) + c;
printf("%d %d %d %d", a, b, c, d);

Output: 2 2 3 4

3.
```
char a = 'x';
int b = '3', c;
c = a - b;
printf("%d %d %c", a, b, c);
```
char a = 'x';
int b = '3', c;
c = a - b;
printf("%d %d %c", a, b, c);

Output: 120 51 E

Que 12 [2M]: Determine the size of array, initialized using the declaration below, following the below rules

1. enter 'ERROR' in case of wrong initialisations
2. include null character in length of char arrays.

A. char arr[16] = "I am Dr. Strange\0";

B. int arr[] = {'A',1.05,53,28};

C. float arr[] = {'A',25.33, 33};

D. char arr[] = {'B',65.33, 72};

Ans :

ERROR,4,3,3

16,4,3,3

16,16,12,3

ERROR,16,12,3

All four answers above have been treated as correct.

Que 13 [3M] : For the given function which takes an array nums and two integers n (length of array) and k. The array is assumed to be sorted in ascending order (nums[i] <= nums[j] for all i < j).

```
int foo(int nums[], int n, int k)
{
    int i = 0, j = 0, cnt = 0;
    for(i = 0; i<n-1; i++)
    {
        while(j < n && nums[j]-nums[i] <= k)
            j++;
        cnt += j-i-1;
    }
    return cnt;
}
```

For a length of array n the maximum value that the function can return is:

A. 2*n

B. n^2

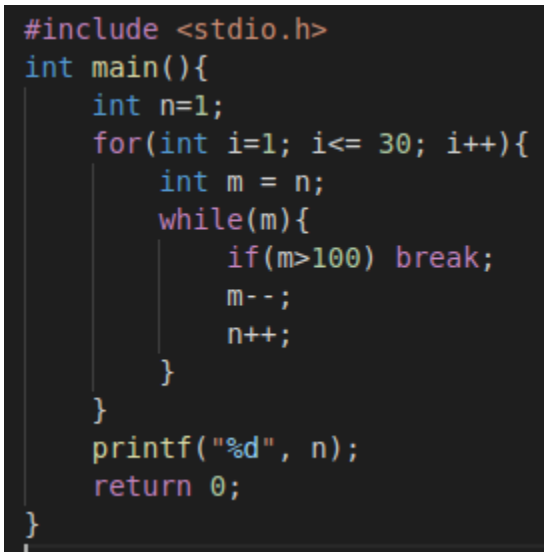
C. n(n-1)/2 **(correct)**

D. n(n+1)/2

Ans: C

Que 15 [3M]

Find the output of the following C program:



```c
#include <stdio.h>
int main(){
    int n=1;
    for(int i=1; i<= 30; i++){
        int m = n;
        while(m){
            if(m>100) break;
            m--;
            n++;
        }
    }
    printf("%d", n);
    return 0;
}
```

(A) Program does not Terminate (B) 64 (C) 128 (D) 1073741824

Answer: **(C)**

Que 16 [4M]

Consider the following code:

```
int eval(int a, int b){
    if(__(1)__)
        return 0;
    if(___(2)__){
        return a/b;
    }
    return a/b+1;
}

int eval1(int x, int y){
    int a = 0;
    while(x > 0 && y > 0){
        x = eval(x/2, y);
        a++;
    }
    return a;
}

int main(){
/*
    //Code Segment 1
    eval(2,eval1(4,2));
*/

/*
    //Code Segment 2
    eval1(eval(53,21),eval1(3,-1));
*/
}
```

Statement 1 - The function eval returns the real value a/b rounded up to the nearest integer, if both a,b are positive integers, else returns 0.

A (1) -> a*b <= 0, (2) -> a%b == 0, will make Statement-1 true.

B Assuming Statement 1, and running Code Segment 1, there are two calls to eval and one call to eval1

C Assuming Statement 1, and running Code Segment 1, in total there is one call to eval1 and three calls to eval

D Assuming Statement 1, and running Code Segment 2, in total there are two calls to eval and two calls to eval1

Answer - A,C

Que 17 [4M]

You are given two integers ‘a’ and ‘b’ and the following snippet stores the value of a into b and the value of b to a without declaring any extra variable. Assume that operation will not exceed the limits of int type variable.

int a=2,b=1;

a=_____A_____
b=_____B_____
a=_____C_____

Please fill in the blanks to complete the code.

(a) If A is a+b: Write B and C for the snippet.

Ans: B = a-b and C = a-b

(b) If B is a+b: Write A and C for the snippet.

Ans: A = a-b and C = b-a

(c) If A is a*b: Write B and C for the snippet.

Ans: B = a/b and C = a/b

(d) If B is a*b: Write A and C for the snippet.

Ans: B = a/b and C = b/a

Que 18 [7M]

Provide an Input such that below C program gives output : You're a genius.

Program:

```c
#include <stdio.h>
int main(){
    int n;
    scanf("%d\n", &n);
    int tr = 0;
    if(n < 4){
        printf("Not try to defeat the Program.\n");
        return 0;
    }
    for(int i=0;i<n;i++){
        int curr = 0;
        for(int j =0;j<n;j++){
            int num;
            scanf("%d", &num);
            curr += num;
            if(i == j)tr += num;
            if(curr %2 == 0 || tr %2 == 0){
                printf("Try to master C lang.\n");
                return 0;
            }
        }
    }
    printf("You're a genius.\n");
    return 0;
}
```

Answer: The first column of n*n matrix input should be odd and others should be even.

Example:

4

1 2 2 2

1 2 2 2

1 2 2 2

1 2 2 2

Q19 : [6M]

What will be the output of the following program?

```
#include<stdio.h>
using namespace std;

void fun(int x){
    x = 2;
    int a[100];
    int pos = 0;
    while(pos<100){
        a[pos] = 10;
        pos++;
    }
    int cnt = 0;
    for(int x=11;x>0;x = ((x-1)&11)){
        a[x] = cnt++;
    }
    printf("%d %d %d %d %d", a[1], a[2], a[5], a[7], a[8]);
    return;
}

int main(){
    fun(1000);
    return 0;
}
```

In case of compilation error, write "COMPILATION ERROR" (case sensitive) in the blank and in case of runtime, write "RUNTIME ERROR" (case sensitive). In all other cases write the output in the blank provided.

Answer-> 6 5 10 10 3

Que 20 [6M] (2x3M) Answer the following questions based on the code given below.

```c
#include <stdio.h>
int main() {
    int i, n, k = 2, flag1 = 1, flag2 = 1;
    scanf("%d",&n);
    while(k <= n) {
        flag2 = 1;
        for(i = 2; i < k; i++) {
            if (k % i == 0) {
                flag2 = 0;
                break;
            }
        }
        if(flag2) {
            if (flag1) {
                printf("%d",k);
                flag1 = 0;
            }
            else {
                flag1 = 1;
            }
        }
        k++;
    }
    return 0;
}
```

(a) What is the output if the input value of n given is 60?

Answer: 2511172331414759

(b) Write down all the other values of n which can be input in order to get the same output as in (a).

Answer: 59, 61, 62, 63, 64, 65, 66

Que 21 [6M] (3x2M)

Complete the code given below to output a^p:

```
int power(int a, int p)
{
    int res = 1, run = a;
    while (p > 0)
    {
        if (__Blank_A__)
        {
            res = res * run;
        }
        p = __Blank_B__;
        run = __Blank_C__;
    }
    return res;
}
```

Blank A:

(i) p % 2 == 1

(ii) p % 2 == 0

(iii) (p & 1) == 0

(iv) p > 0

Answer: (i)

Blank B:

(i) p - (p % 2)

(ii) p - 1

(iii) p / 2

(iv) p - p / 2

Answer: (iii)

Blank C:

(i) run * run

(ii) run + 1

(iii) run * 2

(iv) run + run / 2

Answer: (i)

Que 22 [6M] (3x2M)

You are given the following function, which takes an array a[], and the number of elements in the array n as arguments.

```
int func(int a[], int n)
{
    int b[n];
    int c = -1;
    for(int i=0;i<n;i++)
    {
        b[i] = 1;
        for(int j=i-1;j>=0;j--)
        {
            if(a[i] <= a[j]) continue;
            if(b[i] < b[j] + 1)
            {
                b[i] = b[j] + 1;
            }
            if(c < b[i])
            {
                c = b[i];
            }
        }
    }
    return c;
}
```

*(NOTE) : It is guaranteed the array is not empty (n > 0)

What will be the output for the following inputs:

A)

a[] = {2,1,2,4,5,2}, n = 6

ANS : 4

B)

a[] = {-1,2,-3,1,0,1,5}, n = 7

ANS : 4

C) For an input array of size n, what will be the difference in the maximum and minimum values the function can return

ANS : n-1

Que 23 [10M] (8x1.25M) : Suppose you are given the following piece of code to compute nCr, given parameters n and r.

You need to fill in the blanks appropriately so that the desired value is returned.
(NOTE) : nCr is defined only for positive n and non-negative r in our definition.
Also, statements like 2C4 are invalid, since 4 objects cannot be chosen without replacement from 2 objects.

```
int nCr(int n, int r)
{
    if(n < __(a)__ || r < __(b)__ || n == 0)
    {
        printf("Wrong input\n");
        return -1;
    }
    int p = __(c)__ , q = __(d)__;
    for(int i=__(e)__;i<=n;__(f)__) p = p * i;
    for(int j=r;j>=__(f)__;__(g)__) q = q * j;
    int val = p / q;
    return val;
}
```

ANSWER :
a -> r
b -> 0
c -> 1
d -> 1
e -> n-r+1

f -> i++
f -> (both 1 and 2 are correct)
g -> j - -