COEP TECHNOLOGICAL UNIVERSITY (COEP Tech)
A Unitary Technological University of Government of Maharashtra
(Formerly College of Engineering Pune (COEP))

T1 Examination

Programme: B. Tech | **Semester: III**
Course Code: CT-20003 | **Course Name: Data Structures and Algorithms – I**
Branch: Computer Engineering | **Academic Year: 2023-24**
Duration: 1 Hour | **Max Marks: 20**

Student PRN No. | | | | | | | | | |

Instructions:
1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Exchange/Sharing of stationery, calculator etc. not allowed.
4. Write your PRN Number on Question Paper.
5. Write your answers in the space provided below question.

			Marks

Q1	**a**	`#include <stdio.h>`
		
		`int main()`
		`{`
		`  unsigned int i = 0x80;`
		`  printf("%d ", i << 1);`
		`  return 0;`
		`}`
		
		What is the output of above code?
		
		Answer : ___256_____
		Explanation:
		0x represents hexadecimal number.
		$(0x80)_H$ -> $(128)_{10}$ -> $(1000\ 0000)_2$
		
		So, 1000 0000 (left shift <<) by 1 bit equals. -> (100000000)$_2$ -> $(256)_{10}$
			01

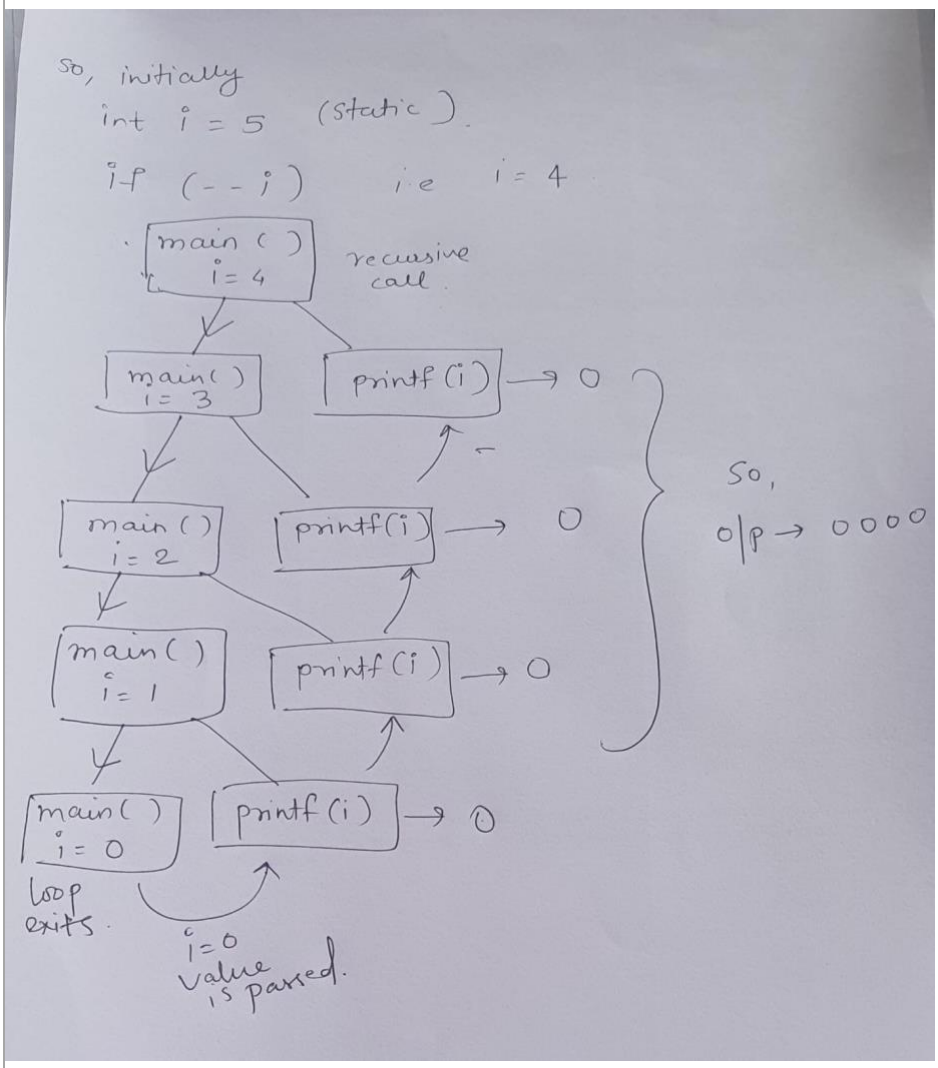
	b	What is the output of following code? `int testarray[3][2][2] = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12};` What value does `testarray[2][1][0]` in the sample code above contain? Answer : ___11_____ Explanation: In this case testarray[3][2][2] there are 3 rows, of 2x2 matrix each. So the above matrix can be represented as below: 1 2 3 4 5 6 7 8 9 10	01

		11 12 Now in testarray [2][1][0], [2] is the last row as indices in array are read from 0. So [2] will read 9 10 11 12 And [1] will read 11 12 th row And [0] will point to 11 i.e 0th index value . so output will be 11.	

	c	In C, 1D array of int can be defined as follows and both are correct.
		`int array1D[4] = {1,2,3,4};`
		`int array1D[] = {1,2,3,4};`
		Given the following definitions (along-with initialization) of 2D arrays, select the correct statements.
		Select one or more:
		
		`a. int array2D[][] = {1,2,3,4,5,6,7,8};`
		`b. int array2D[2][] = {1,2,3,4,5,6,7,8};`
		`c. int array2D[2][4] = {1,2,3,4,5,6,7,8};`
		`d. int array2D[][4] = {1,2,3,4,5,6,7,8};`
		
		Answer:_____c and d_____ (Write option numbers)
			01

	d	`#include <stdio.h>`
		
		`int main()`
		`{`
		`  static int i = 5;`
		`  if(--i){`
		`  main();`
		`  printf("%d",i);`
		`  }`
		`  return 0;`
		`}`
		
		What is the output of above code?
		
		Answer : ____0000_____
		Explanation:
		
		Static variables are initialized only once. Static variables have a lifetime scope and they retain their value between function calls.
		
		"i" is first initialized to 5. in the if condition the value of i is changed to 4.
		main() is called again and the value of i is changed to 3 in the if condition and main is called again.
		Now the value of i is changed to 2 and main is called again.
		Now the value of i is changed to 1 and main is called again.
		
		After this the value of i is changed to "0" and the block is excited.
		
		As the value of i is now "0", it is printed 4 times for each of the calls for main().
		So, the ans will be 0000
			01

A static variable is shared among all calls of a function. All calls to main() in the given program share the same i. i becomes 0 before the printf() statement in all calls to main().



Now think what would have been the output if I was not declared as static integer?????

e What is the output of following code? 01

```
#include <stdio.h>

int main() {
    int a,b=0;
    static int c[10]={1,2,3,4,5,6,7,8,9,0};
    for(a=0;a<10;++a)
        if((c[a]%2)==0)
            b+=c[a];
        printf("%-d",b);

    return 0;
}
```

Answer : _____

For loop will read each value in array.
If value will is even it is added to b
b =2+4+6+8+0 =20

		Ans :20 %-d does not impact the output.	

Q 2	a	What does the below code evaluate?
		
		`#include<stdio.h>`
		
		`int f(){`
		`printf("Executing function");`
		`return 0;`
		`}`
		
		`int main() {`
		`if(5<4 && f())`
		`printf("1");`
		`else`
		`printf("0");`
		`return 0;`
		`}`
		Answer : ____0_____
		This is an example of short circuit evaluation.
			01

	b	`#include <stdio.h>`
		
		`struct st`
		`{`
		`int x;`
		`static int y;`
		`};`
		`int main()`
		`{`
		`printf("%d", sizeof(struct st));`
		`return 0;`
		`}`
		Assume that size of an integer is 32 bit. What is the output of following program?
		
		Answer : Compiler Error_____
		
		In C, struct and union types cannot have static members
			01

	c	If x is one dimensional array, then pick up the correct answer. a. *(x+i) is same as x[i]+1 b. *(x+i) is same as *x[i] c. *&x[i] is same as (x+i) d. *(x+i) is same as &x[i] Answer:_____d_____	01

Q 3	a	`#include <stdio.h>`
		
		`void foo(int n, int sum)`
		`{`
		`int k = 0, j = 0;`
		`if(n == 0)`
		`return;`
		`k = n%10;`
		`j = n / 10;`
		`sum = sum + k;`
			02

```
  foo(j, sum);
  printf("%d",k);
}
int main()
{
    int a = 2048, sum = 0;
    foo(a,sum);
    printf("%d\n", sum);
    return 0;
}
```

What is the output of above code?

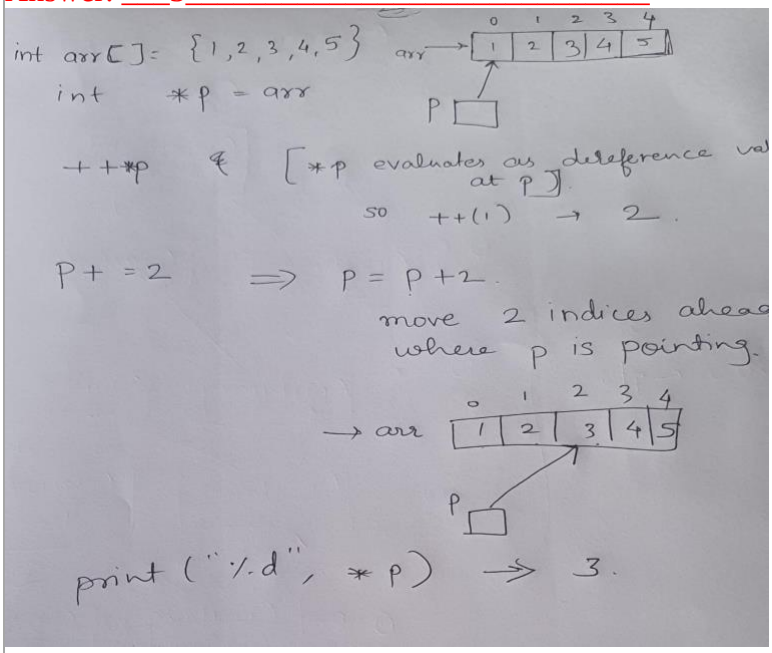
Answer : __20480_____

The function foo is recursive function
When we call foo(a, sum) =foo(2048,0)
k j sum
k = 2048%10 j =204 sum = 0+8=8
foo(204,8)
k = 204%10 = 4, j =20 sum = 8+4 =12
foo(20,12)
k = 20%10 = 0 j = 2 sum = 12+0=12
foo(2,12)
k = 2% 10 = 2 j = 0 sum = 12+ 2 =14
foo(0,14) function will be terminated and value of k will print in stack way i.e.. 2, 0, 4, 8 and sum = 0. Since sum is a local variable in the main function so the print sequence is 2, 0, 4, 8, 0

b Choose the correct option to ***fill the missing expressions*** so that the program below prints an input string in reverse order. Assume that the input string is terminated by a newline character. 02

```
#include<stdio.h>

void reverse(void)
{
   int c;
   if ( __BLANK 1___ ) reverse() ;

   ___BLANK 2________
}

int main()
{
   printf ("Enter Text ");
   printf ("\n");
   reverse();
   printf ("\n");
   return 0;
}

BLANK 1 :
   A. ((c = getchar()) != '\n')
   B. (c != '\n')
   C. (getchar() != '\n')

BLANK 2:
   A. putchar(c);
```

		B. getchar(c); Answer:	

	c	What will be the output of the program?
		
		`#include <stdio.h>`
		`int main()`
		`{`
		`  int arr[] = {1, 2, 3, 4, 5};`
		`  int *p = arr;`
		`  ++*p;`
		`  p += 2;`
		`  printf("%d", *p);`
		`  return 0;`
		`}`
		
		Answer: ___3_____
		 
			01

	d	What does the following statements print?
		
		`for (i=1;i<4;i++)`
		`  printf("%d",(i%2)?i:2*i);`
		
		Answer: __143_____
			01

Q 4	**a**	Transpose of a matrix is obtained by changing rows to columns and columns to rows. In other words, transpose of A[N][M] is obtained by changing A[i][j] to A[j][i].
		Given a matrix of size N X M, write a program in C to find the transpose of the matrix. Your approach should be applied on both square and rectangular shaped matrices.
		
		Answer:
		
		`// C program to find`
		`// transpose of a matrix`
		
		`#include <stdio.h>`
		`#define R 3`
		`#define C 4`
			04

```
void transpose(int A[R][C], int B[R][C])
{
    int i, j;
    for (i = 0; i < R; i++)
        for (j = 0; j < C; j++)
            B[j][i] = A[i][j];
}

int main() {
  int A[R][C] = { { 1, 1, 1, 1 },
                  { 2, 2, 2, 2 },
                  { 3, 3, 3, 3 } };

  int B[R][C], i, j;
  //printing entered matrix
  printf("\n Given Matrix:\n");
  for (int i = 0; i < R; ++i)
  for (int j = 0; j < C; ++j){
      printf("%d  ", A[i][j]);
      if (j == C - 1)
      printf("\n");

  }
  transpose(A,B);
  printf("\nTranspose of the Given matrix:\n");
  for (int i = 0; i < C; ++i)
  for (int j = 0; j < R; ++j) {
    printf("%d  ", B[i][j]);
    if (j == R - 1)
    printf("\n");
}
  return 0;
}
```

b Write a function `strcpy(str1,str2)` in C which copies the content of string 1 to string 2. 02

```
#include <stdio.h>

void strcpy(char s1[],char s2[]){
    int i;
    for ( i = 0; s1[i] != '\0'; i++) {
        s2[i] = s1[i];
    }
    s2[i] = '\0';
}

int main() {
    char s1[100], s2[100];
    printf("Enter string s1: ");
    fgets(s1, sizeof(s1), stdin);
    strcpy(s1,s2);
    printf("String s2: %s", s2);
    return 0;
}
```
