



Roll No: CS22B1080

Name: Avaneelakare

Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram

Mid Semester Examination, December 2022

Course Code: CS1000

Batch: First Semester 2022-2023

Date of Examination: 26th Dec 2022

Duration: 90 minutes

Course Title: Problem Solving and Programming

Category: Core

Max. Marks: 30

Instructions to students:

- Use answer scripts to write answer, step-wise answer should be written.
- If required, make assumptions and highlight the made assumptions.
- Write the answer section-wise.

PART – A (8 x 1 Marks = 8 Marks)

1. Consider the following code:

```
#include<stdio.h>
void main()
{
    int a =2;
    switch(a)
    {
        case a: printf("Value is %d.\n",
        2);
        default: printf("This is default
        statement.");
    }
}
```

Which of the following option lists the correct statement for the above code?

- a. Compilation error
- b. Value is 2.
- c. This is default statement.
- d. Value is 2. This is default statement.
- e. None of the above

2. The below code is syntactically correct

```
#include <stdio.h>
void main()
{
    if(-10)
        printf("-1 ");
    else if(0)
        printf("0 ");
    else
        printf(" 1 ");
}
```

Which of the following option is the correct output for the above code?

- a. -1
- b. 0

c. 1

d. Compilation Error

e. None of the above

3. Consider the following declaration statement:

- I. int 1_35;
- II. float _income;
- III. int a!;
- IV. char name123;
- V. int num-data;

Which of the following option lists all the correct declaration statements from above?

- a. I, II, and V only
- b. II, and III only
- c. II, and IV only
- d. I, III, and IV only
- e. II, IV, and V only

4. What is the output. Justify in one or two line.

```
#include<stdio.h>
void main(){
    int a=5;
    if(a==5){
        printf("Value of a is %d.\n", 5);
        printf("Successfully executed if
        statement. \n");
    }
    else;
    printf("Successfully completed
    else statement.");
}
```

Which of the following option is the correct output for the above code?

- a. Value of a is 5 Successfully executed if statement.
- b. Successfully completed else statement.
- c. Compilation error
- d. None of the above

5. Consider the following code

```
void main()
{
    int c=0, d;
    if(c++){
        d=++c;
        printf("The if is %d and
        %d.\n",d, c);
    }
    else{
        d=c++;
        printf("The else is %d and
        %d.\n",d, c);
    }
}
```

Find the correct option

- (a) The if is 0 and 0.
- (b) The if is 2 and 2.
- (c) The else is 1 and 2.
- (d) The else is 0 and 2.
- (e) The else is 2 and 2.
- (f) Compilation error
- (g) None of the above

6. Consider the following code and find the output and justify:

```
void main()
{
    int a;
    printf("Enter the value of a (a
    natural number)");
    scanf("%d", &a);
    a=a%3;
    if(a==0)
    {
        printf("Divisible by 3");
    }
    else
    {
        printf("Not Divisible by 3");
    }
}
```

Example:

If input is 5
If input is 6

7. What is the output of the following program and fill out the missing part?

```
#include<stdio.h>
main()
{
    space - 10>10
    int i=10, m=10; 10*10
    printf(" ", i>m?i*i:m/m, 20); 10
}
```

8. Convert the following decimal number to binary form: $(435)_{10}$

PART – B (6 x 2 marks = 12 marks)

1. Explain the output/error for the following codes.

```
void main(){
    int ch = ('a' + 'b'*'c')%2;
    switch ( ch )
    {
        case 'a':
        case 'b':
            printf ( "\nYou entered b" );
        case 'A':
            printf ( "\nYou entered in A" );
        case ('b'*'c'+ 'a')%2:
            printf ( "\nYou are performing arithmetic operation." );
    }
    printf ( "\nYou are outside the switch" );
}
```

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2. Find the value of following variables w, x, y, z, a, b. Show the steps for each expression in one or two lines.

```
void main()
{
    int i = 10, j = -4, k = 0, w, x, y, z;
    w = i || j || k;
    x = i && j && !k;
    y = i || j && k;
    z = i+2*j-2 && j + 4 || k;
    printf ("\\nw = %d x = %d y = %d z = %d", w, x, y, z);
}
```

3. Find the value of following variables w, x, y, z. Show the steps how you are evaluating the expression.

```
void main( )
{
    int m = 4, n = 2, p = 2, w, x, y, z, a, b;
    w = m * n / 4 - 6 / 2 + 2 / 3 * 6 / p;
    x = m < n / p - 4 / 2 + 2 * 3 - 6 > ! p;
    y = m * p % 2 + 4 - m * 2 / 2;
    z = m++ + --p + ++n;
    printf ("\\nw = %d x = %d y = %d z = %d", w, x, y, z);
}
```

4. Rewrite the following code using IF-ELSE structure without losing functionality. The output of switch and IF-Else must be same.

```
#include<stdio.h>
void main( )
{
    int a, b;
    scanf("%d %d", &a, &b);
    switch(a < 4 && b > 7)
    {
        default: printf("-1");
        case 0: printf("0");
        case '1': printf("1");
        case 2: printf("2\\n");
        break;
        case 3: printf("3");
    }
}
```

28/3 3/6
3/20
3/3
0.66
6/6
3.96

5. Consider the following code. Fill the appropriate statement in the blank space. Justify your logic in one or two line.

```
void main()
{
    int c, a, b, d;
    printf("Enter the number\\n");
    scanf("%d", &a);
    b = a % 4;
    c = a % 5;
    d = _____;
    switch(d)
    {
        case _____:
```

```

printf("The number is either divisible by 4 or 5");
break;
case _____:
printf("The number is neither divisible by 4 or 5");
}

```

Sample input/output:

10

The number is either divisible by 4 or 5

6

The number is neither divisible by 4 or 5

6. The following program is to print the greatest value between sum of a and b, and product of g and e. [Don't use any if else statement, switch statement or ternary operator]. Justify your logic in one or two sentence.

```

void main()
{
int a,b,c,d,e,f,g;
printf("Enter four values a,b,d and e\n")
scanf("%d%d%d%d",&a,&b,&d,&e);
_____;
_____;
_____;
printf("The greatest value of (a+b) and (d*e) is %d", g);
}

```

Sample input/output:

Enter four values a,b,d and e

2 6 1 3

The greatest value of (a+b) and (d*e) is 8

PART - C (2 x 5 marks = 10 marks)

1. Write a c program to check whether a given three digit number is an Armstrong number or not.
Note: A 3 digit armstrong number is a number whose sum of cubes of individual digits are equal to the number itself.

$$\text{Eg. } 371 \Rightarrow 3^3 + 7^3 + 1^3 = 27 + 343 + 1 = 371$$

2. There are three friends, Thor, Loki and Hulk. They play a dice game where they roll the dice and get a value from 1 - 6. If the value of any two friends is combined and if half of the combined value is less than the third friend's value, then the third friend wins and the other two lose. If the condition is not satisfied, nobody wins. If suppose one wins then the answer is straightforward but If at a time two people win i.e. if Thor and Hulk both are winners, then by nature Thor will overpower Hulk and Thor will be the final winner; if Loki and Hulk both are winners, then by power Hulk will overpower Loki and Hulk will be the final winner and if Loki and Thor are winners, then by trick Loki will overpower Thor and Loki will be the final winner. Finally, if Thor wins - print Thunder, if Loki wins - print Mischief and if Hulk wins - print Power.

Write a C code for the above problem with proper syntax, scanf and printf statements.



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Name:

Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram

End Semester Examination, February 2023

Course Code: CS1000

Batch: First Semester 2022-2023

Date of Examination: 23rd February 2022

Max. Marks: 60

Course Title: Problem Solving and Programming

Category: Core

Duration: 3 hours

Total:

Instructions to students:

- ASCII value of '0' is 48, ASCII value of 'a' is 97 and ASCII value of 'A' is 65.

Section - A (10 x 1 mark = 10 marks)

1. In C, what is the meaning of following function prototype

```
int func(int *, float *, int, char);
```

Passing four parameters in order

_____, _____, _____, _____

What will be the output of the program?

- (a) 47, 11 (b) 11, 47 (c) 47, 20 (d) 11, 20

4.

```
int f( int n )
{
    static int i = 1;
    if(n >= 5)
        return n;
    n = n+i;
    i++;
    return f(n);
}
```

What will be the value returned by f(1)?

2. What do you expect from this code?

```
void main ()
```

{

```
    int a = 3, b = 4, c, d;
    c = b-a; d = a || b;
    switch ( c )
    {
        case 1 || 2 && 15%5:
            printf ("I got Grade S\n");
            break;
        case !(10%3*5%5) && -10:
            printf ("I got Grade A\n");
            break;
    }
    printf("Success\n");
}
```

3. Consider an 8-bit representation of two numbers.

```
void main ()
```

{

```
    int a = 15, b = 27, k, m;
    k = a ^ 32; m = a & b;
    printf ("\nk = %d, m = %d", k, m);
```

5. According to the previous program (in Q. 4):

- a. Static variable i can be accessed from main but ends when function f finishes
 b. Static variable i cannot be accessed from main but remains even after function f finishes execution
 c. Static variable i cannot be accessed from main and ends when the function f finishes execution
 d. Static variable i can be accessed from main but remains even after function f finishes execution

6. Recursive call is executed in _____?

- a. First in First out order
 b. Last in First out order

7. Match the following header files (string.h and stdio.h) with function.

strlen() - _____

printf() - _____

scanf() - _____

strcpy() - _____

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8. What will be the output of the program?

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

```
int i=10;
```

```
void check()
```

```
{
```

```
printf("%d", i++);
```

```
}
```

```
void main()
```

```
{
```

```
int i=20;
```

```
printf("%d", i);
```

```
check();
```

```
printf("%d", ++i);
```

```
}
```

(a) 10 20 21

(b) 20 10 21

(c) 21 20 21

(d) 20 21 10

9. Which one is incorrect among the following options?

```
int *p, *q, *r, x=5, y=6, z, a[10]={1,2};
```

```
p=&x; q=&y; r=a;
```

(a) (*p) * (*q)

(b) z=(r++/2)

(c) q-p

(d) *p +5

10. What will be the output of the program?

```
int main()
```

```
{
```

```
int x = 20, y=21, *z;
```

//Assume x, y and z are continuous starting from address 5000, size of the integer is 4 bytes

```
z = &x; *z++; x++;
```

```
printf("x = %u, y = %u, z = %u, ", &x, &y, &z);
```

```
printf("x = %u, y = %u, z = %u \n", x, y, *z);
```

```
return 0;
```

```
}
```

a. 5000, 5004, 5012, 20, 20, 20

b. 5000, 5004, 5008, 20, 21, 21

c. 5000, 5004, 5008, 21, 21, 21

d. 5000, 5004, 5008, 21, 20, 21

Section - B (10 x 2 marks = 20 marks)

1. Find the output of the following code:

```
void main()
```

```
{
```

```
int x = 4, y = 4, z;
```

```
while (y)
```

```
{
```

```
y--;
while(x) {
    if (x != y) {
        printf ("\n%d %d", x, y);
        x--;
    }
    else
        break;
}
x++;
}
```

2. What will be the output for the following code:

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

```
void main ()
```

```
{
```

```
int i = -3, j = 3, x = 10, y = 15;
```

```
if (li + lj * 1)
```

```
    printf("One \t");
```

```
else if (x % 2 == y % 3)
```

```
    printf("Two \t");
```

```
else
```

```
    printf("Three \t");
```

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

```
}
```

3. What does the following program will print?

```
void func (int n, int sum)
```

```
{
```

```
int k = 0, j = 0;
```

```
if (n == 0)
```

```
    return;
```

```
k = n % 10;
```

```
j = n / 10;
```

```
sum = sum + k;
```

```
func (j, sum);
```

```
printf ("%d, ", k);
```

```
}
```

```
int main ()
```

```
{
```

```
int a = 2048, sum = 0;
```

```
func (a, sum);
```

```
printf ("%d", sum);
```

```
}
```

- a. 8, 4, 0, 2, 14
- b. 8, 4, 0, 2, 0
- c. 2, 0, 4, 8, 0
- d. 2, 0, 4, 8, 14

4. What will be the output of the following code?

```
int cal ( int *i, int j )
{
    *i = *i * *i;
    j = j * j;
    return (2*j);
}

void main()
{
    int i = 5, j = 2, t=5;
    t=cal (&i, &j);
    j=j+t*3;
    i=i-t+7;
    printf ("\\n%d,%d", i, j );
}
```

5. What will be the output of the following code?

```
void main(){
    int i = 4, j = 2, *ptr, *qtr;
    ptr=&i; qtr=&j;
    printf ("%u,%u,%u\\t", *ptr, *j, **&ptr);
    printf ("%u,%u,%u \\n", *ptr, *qtr, i, *qtr);
}
```

6. What will be the output of the following code?

```
struct product_details {
    char productName[10];
    float price;
};

int main()
{
    struct product_details p1={"Pen", 30.0};
    struct product_details p2={"paper", 120.0};
    struct product_details p3;
    p3=p2;
    p3.productName[0] = 'P';
    p2.price=p3.price/4;
    printf("%s, %f\\n", p1.productName, p1.price);
    printf("%s, %f\\n", p2.productName, p1.price);
    if(p3.price > p2.price)
        printf("%s, %f\\n", p3.productName, p3.price);
    return 0;
}
```

7. What will be the output of the following code?

```
void f1 (int a, int b)
{
    int c;
    c=a; a=b; b=c;
}

void f2 (int *a, int *b)
{
    int c;
    c=*a; *a=*b; *b=c;
}

int main()
{
    int a=4, b=5, c=6;
    f1(a, b);
    f2(&b, &c);
    printf ("%d", c-a-b); (5)
    return 0;
}
```

8. What will be the output of the following code?

```
#include <string.h>
void main()
{
    char str1[20]="aabba", str2[10];
    strcpy(str2, str1)
    printf("%s\\n", str2);
    str1[3]='d';
    if(strcmp(str1, str2)>0)
        printf("Success %s\\n", str1);
    else
        printf("Failure %s\\n", str2);
}
```

9. What will be the output?

```
void func(int *arr1, int *arr2, int size) {
    int i;
    for (i=0; i<size; i++) {
        arr2[i] = ++(*arr1+i));
    }
}

void main()
{
    int arr1[10]={2, 2, 3, 3, 4, 4, 4, 4, 5};
    int arr2[10];
    func(arr1, arr2, 10);
    int i;
    for (i=0; i<10; i++)
        printf("%d\\n", *(arr2+i));
}
```

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10. Write the output of the program:

```
#include <stdio.h>
struct node {
    int id, val;
}*nptr;
void detail(struct node *nptr, int n)
{
    for(int i=0; i<n; i++) {
        if(nptr->val%2==0)
        {
            printf("%d %d\n", nptr->id, nptr->val);
        }
        else
            printf("%d %d\n", nptr->id, nptr->val*2);
        nptr++;
    }
}
int main()
{
    int n=5;
    struct node List[]={{1, 37}, {2, 16}, {3, 84}, {4, 71}, {5, 48}};
    nptr=&List[0];
    detail(nptr, n);
    return 0;
}
```

Section - C (30 marks)

Q1. Write a C Program to do the following operations on a string:

Get a character variable named ch. Get a string (all in smaller case with atleast one odd ASCII valued character and atleast one even ASCII valued character) stored in the variable named base.

Write a function that separates and stores all the odd valued ASCII characters as a first partition of a new string (str2) and all even numbered ASCII values as the next partition of the new string (str2). New string is to be printed in the main function.

Create another function that will find whether the entered character (ch) is a part of the character set of base in strictly less than n comparisons. Count the comparisons and also return the value to main function.

Write third function that passes base string and creates a new string (named str3) where any value greater than the ASCII value of the character (ch) should form as the first portion of a str3, followed by the character itself if the same character is available. The final portion should consist of values which are less than the ASCII value of the given character. Given the base (string) as input from the user (without

space), and a character named ch, do the above mentioned operations in sequence. (10 marks)

Q2. Write a program to update integer array elements using a pointer. The pointer to be used should be assigned the address of the first element of the array and then be used to access the array from starting till the end. First element will always have an odd value. If there is no odd value available before an even number, subtract one from the current even value and make it odd (from left to right). Finally, use the same array pointer to traverse the whole updated array from first element to the last element. The whole operation should happen in a function named Find(), to which the pointer pointing to array is to be passed.

4 //number of elements

1 2 6 4 //input

1 1 5 4 //output

octal

Q3. Consider a structure of five members, three strings (member names are str1, str2, str3) and two numbers (named as dec and hexd). All the three strings will store only sequence of characters '0' and '1' i.e. it will represent a binary value as a string. Create a variable of this structure and take str1 and str2 from the user. There are two functions named convert() and add(). The function add() will add two binary values (in string form) to find a final string of binary values which is sum of both binary values, again represented in binary form. The function named convert() will convert a given string into its corresponding decimal value and hexadecimal value.

Note: A user will initially give as input, two strings str1 and str2, which are members of structures. The user will also pass the structure variable to the function add() to add the two binary values str1 and str2 and store the result in str3 (string). Pass the whole structure to convert and update the members dec and hexd which are based on str3. (8 marks)

The program should update all the members of the structure, given values str1 and str2 by the user.

Example:

Input:

0001001 (str1)

0000110 (str2)

Output

0001111 (str3)

15 (deci)

F (hexadecimal)

Q4. Write a C program to find factors of a given number (integer). (5 marks)

Indian Institute of Information Technology, Design and Manufacturing Kancheepuram

Mid Semester Examination

Date: Dec 19, 2022

Duration: 2 hours

Course: Engineering Electromagnetics

Code: PH1000

Maximum marks: 30

All questions are necessary, bold letters represent vectors and capped letters represent unit vectors

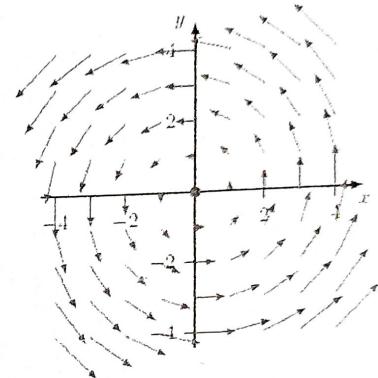
1. Two vectors \vec{u} and \vec{v} are given at a point P in space as $\vec{u} = 10\hat{r} + 30\hat{\theta} - 10\hat{\phi}$ and $\vec{v} = -3\hat{r} - 10\hat{\theta} + 20\hat{\phi}$, find the vector projection of \vec{u} in the direction of \vec{v} . (2)

2. If $\vec{A} = 12\hat{r} + 5\hat{\theta} + \pi\hat{\phi}$ is given at point $P(2, \pi, \pi/2)$ and $\vec{B} = 2\hat{r} + 0.5\pi\hat{\theta}$ is given at point $Q(5, \pi/2, \pi/2)$, find $\vec{C} = \vec{A} + \vec{B}$. (4)

3. (i) Determine the mathematical expression for the vector field that correctly describes the picture given below. (1)

(ii) Draw the vector field diagram for the function $\mathbf{F}(x, y) = \hat{x} + x\hat{y}$

(1)

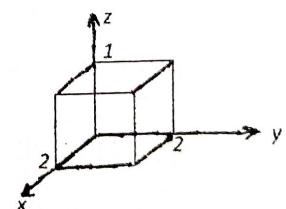


4. Given a point $P(8, \pi/6, \pi/3)$ and a vector $\mathbf{A} = 2\hat{r} + \sqrt{3}\hat{\theta} - 2\hat{\phi}$, express P in cylindrical coordinates. Then evaluate the value of \mathbf{A} at the point P in cylindrical coordinates. (4)

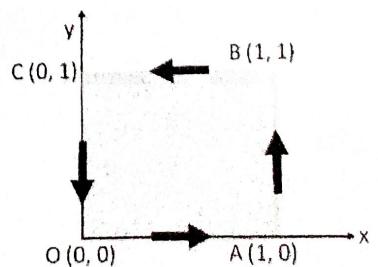
5. The temperature (T) in space is given by the equation $T(x, y, z) = x^3/(4\sqrt{3}) + e^{-z}y^2$. Determine change in the temperature at point $P(8, \pi/6, 6)$, in cylindrical coordinate system, in the direction from the point P to the origin. (4)

6. Under the influence of an electrostatic field, a particle moves so that its position at time t, for $0 \leq t \leq 1$, is $(t, t, t^{3/2})$. At $t = 1$, the field is turned off so that the particle continues to move at the same velocity it had reached at $t = 1$. Find the arc length of the path traveled by the particle between times $t = 0$ and $t = 1$. (2)

7. Check divergence theorem for function $\mathbf{v} = xy\hat{x} + 2yz\hat{y} + 3zx\hat{z}$ for a following cuboid. (6)



8. Given vector $\mathbf{F} = x^2y\hat{x} + 2xy^2\hat{y}$, find circulation of \mathbf{F} along a closed path OABC as shown in figure. Further, verify the Stoke's theorem with the obtained results? (6)



Roll No.: CS22B1080

Name: Avanee Sarang Lakare



Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram
Mid Semester Examination – December 2022

Course Code: MA1000

Batch: CS22B1/CS22B2/EC22B/ME22B1/ME22B2

Date of Examination: 19.12.2022

Duration: 1 hour 30 minutes

Course Title: Calculus

Category: Core

Instructors: Dr Manish/Dr Sai/Dr Vijay

Maximum Marks: 30

1. Prove using the $\epsilon - N$ definition that the sequence $\left\{ \frac{1}{\ln(n+1)} \right\}$ converges. (2)
2. Evaluate the following: (2 + 1)
 - (a) $\lim_{n \rightarrow \infty} (\sqrt{n^2 + n} - n)$.
 - (b) $\lim_{n \rightarrow \infty} \sin(n! \alpha \pi)$, where α is a rational number.
3. Find the limit of the sequence $\{a_n\}$ if $a_n = \frac{1}{(1+n)^2} + \frac{1}{(2+n)^2} + \dots + \frac{1}{(2n)^2}$. (2)
4. Let $\{a_n\}$ be a convergent sequence. Prove the following: (2 + 1)
 - (a) $\{a_n\}$ is bounded.
 - (b) $\{a_n\}$ is Cauchy.
5. Discuss the convergence (absolute/conditional) of the following series.
 - (a) $\sum_{n=2}^{\infty} \frac{1}{(\ln n)^p}$, where p is any constant. (2)
 - (b) $\sum_{n=27}^{\infty} \frac{(-1)^{n+1}}{\ln(\ln n)}$. (2)
 - (c) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^p}$, where p is any constant. (3)
6. Show that if $\sum a_n$ diverges, then $\sum |a_n|$ diverges. (2)
7. Let $\sum a_n$ be a convergent series of positive terms. Prove that $\sum a_n^2$ also converges. (2)
8. Prove that if the power series $\sum a_n x^n$ converges for $x = c \neq 0$, then it converges absolutely for all x with $|x| < |c|$. (3)
9. Find the power series representation of the function $f(x) = \frac{x^{123}}{x^2 - 2x + 1}$ about $x = 0$. Also determine its interval of convergence. (3)
10. Find the Taylor series generated by $\frac{1}{1+x^2}$ at $x = 0$. Also determine the interval of convergence of this series. (3)

Roll No.: CS22B1080

Name : Avaneet Lakare



Indian Institute of Information Technology, Design and Manufacturing, Kanchipuram
End Semester Examination – February 2023

Course Code: MA1000

Batches: CS22B1/CS22B2/EC22/ME22B1/ME22B2

Date of Examination: 20.02.2023

Duration: 3 hours

Course Title: Calculus

Category: Core

Instructors: Dr Manish / Dr Sai / Dr Vijay

Maximum Marks: 50

1. A sequence $\{a_n\}$ is defined recursively as follows: $a_1 = 10$ and $a_{n+1} = \frac{1}{2} \left(a_n + \frac{10}{a_n} \right)$ for $n \geq 1$. Prove the following: (a) The sequence $\{a_n\}$ is bounded below. (b) The sequence is monotonically decreasing. Hence conclude that $\{a_n\}$ converges. Also find its limit. (3)

2. Let a and b be some numbers. If $a_n \rightarrow a$ and $b_n \rightarrow b$, then prove that $a_n b_n \rightarrow ab$. (3)

3. Let $\sum a_n$ be a convergent series. Prove that for every $\epsilon > 0$, there corresponds a positive integer N such that for all $m, n \geq N$ with $m \leq n$, $\left| \sum_{k=m}^n a_k \right| < \epsilon$. Hence conclude that $a_n \rightarrow 0$. (3)

4. Prove in three different ways that the harmonic series $\sum \frac{1}{n}$ diverges. (4)

5. Find the sum of the series $\sum_{n=0}^{\infty} \frac{n^2}{2^n}$. (3)

6. Let a function $f(x)$ be defined on an interval $(-R, R)$ using a power series:

$$f(x) = \sum_{n=0}^{\infty} a_n x^n, \quad -R < x < R,$$

- where $R > 0$. Prove that the Maclaurin series of $f(x)$ equals $\sum_{n=0}^{\infty} a_n x^n$. (3)

7. Let $f(x) = \begin{cases} x \sin \frac{1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$ and let $g(x) = \begin{cases} x^2 \sin \frac{1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$. Prove: (a) $f(x)$ is continuous. (b) $g(x)$ is differentiable. (4)

8. If u and v are differentiable functions of x , prove that $\frac{d}{dx} \left(\frac{u}{v} \right) = \frac{v du - u dv}{v^2}$. (3)

9. State and prove Rolle's theorem. (3)

10. State and prove the first derivative theorem for local extreme values. (3)

(PTO)

11. Define a critical point of a function. Locate the critical points of the function

$$f(x) = \begin{cases} |x| & \text{if } -\pi \leq x < 0 \\ \sin x & \text{if } 0 \leq x \leq \pi \end{cases}$$

Also determine the absolute extrema of $f(x)$. (3)

12. Give an example of a function that is not Riemann integrable. Justify your answer. (2)

13. Let $a_n = \frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{2n}$. Prove that $\lim_{n \rightarrow \infty} a_n = \int_0^1 \frac{1}{1+x} dx$. (3)

14. If f is Riemann integrable on $[a, b]$ and if there is a differentiable function F on $[a, b]$ such that $F'(x) = f(x)$, then prove that $\int_a^b f(x) dx = F(b) - F(a)$. (4)

15. Using the $\epsilon - \delta$ definition, prove that $\lim_{(x,y) \rightarrow (0,0)} \frac{4xy^2}{x^2 + y^2} = 0$. (3)

16. Let $f(x, y) = \begin{cases} 1 & \text{if } xy = 0 \\ 0 & \text{if } xy \neq 0 \end{cases}$ be a function of two variables. (3)

(a) Prove that the partial derivatives of $f(x, y)$ exist at $(0, 0)$.

(b) Prove that the function $f(x, y)$ is not continuous at $(0, 0)$.



Avaneec Lakare
CS22B1080

**Indian Institute of Information Technology, Design and Manufacturing,
Kancheepuram, Chennai-600127**

End-Semester Exam

Course: Effective Language and Communication Skills - HS1000

Time: 2 hours

February 25, 2023

Maximum Marks: 40

1. Write a short essay on effective communication (150 words/10 marks)
2. Assuming that you have the requisite credentials, draft a job application letter in response to the following advertisement. (10 marks)

Location: Chennai

Role: Software Analyst

Qualification: B.Tech/ M. Tech

We are looking for energetic and passionate fresher 0-1 years of software experience willing to join immediately.

Skills Required:

- Knowledge in C, C++, Java, .Net, Perl, html, Javascript.
- Good communication skills with analytical and problem solving abilities. Must be a good team player.
- Ability to take ownership in carrying out tasks individually and work without guidance
- Must be proactive and ability to adapt quickly

Apply immediately – Manager

3. How does the use of social media affect students' cognitive abilities? Present your perspective with supporting arguments. (150 words/10 marks)

(Cognitive abilities include mental abilities like reasoning, problems solving, perception etc.)

4. Your friend is preparing an oral presentation of a report that she prepared.

What are the suggestions that you would give her? (2 Marks)

5. Choose the correct word from the two words given in the brackets. (2 Marks)

- a) The elderly woman, though uninjured, was (quiet, quite) shaken by her experience.
- b) The engine was (stationary, stationery) because it has toppled onto its side.