POST-GRADUATE COURSE

Term End Examination — June, 2022/December, 2022

MATHEMATICS

Paper-4B : COMPUTER PROGRAMMING & ITS APPLICATION TO NUMERICAL ANALYSIS

Time : 2 hours]   [Full Marks : 50

Weightage of Marks : 80%

Special credit will be given for accuracy and relevance in the answer. Marks will be deducted for incorrect spelling, untidy work and illegible handwriting. The marks for each question has been indicated in the margin.

Use of scientific calculator is strictly prohibited.

Answer Question No. **1** and any *four* from the rest :

1. Answer any *five* questions :   2 × 5 = 10

    a) What is the difference between 'continue' and 'break' statements ?

    b) A for loop is given below :

    ```
    for( p=4, p<14,++p)
    ```

    What is wrong in the above statement ?

    c) What is void pointer ? When is it used ?

    d) Convert the following infix expression into postfix expression :

    $A + B * C - (D + E) * C$

    e) An array a has been initialized as follows :

    ```
    int a[5] = {1,5,9}.
    ```

    Determine the values of a[0],a[4].

    f) Explain 'switch' statement with example.

    g) Determine the value of variable s and i after executing the following code.

    ```
    int s=0, i;
    for ( i=0; i<=10; i++)
        s=s+i;
    ```

h)   What is the value of x after executing the following code ?
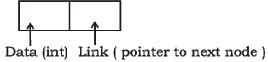
```
int x=10;
    x = ! x>15;
```

2.   a)   Explain the term θ in connection with analysis of algorithm.   3

b)   Find out suitable values of C_1, C_2 and n_0 such that $3n+7=\theta(n)$, where symbols have their usual meanings.

3

c)   Suppose T is the pointer to the first node to a non-empty linked list where every node has following structure :

Data (int)   Link (pointer to next node)

Write an algorithm to insert a node containing 5 as the data element at the beginning of the list T. You can use a function getnode ( ) which returns a pointer to free node.   4

3.   a)   Explain following statements in C with an example :

(i)   Nested if

(ii)   Multi-alternative if.   2 + 2

b)   A programmer is asked to write a program to display 'Hello' 5 times using a while loop. The programmer has written following program.

```
int n=4; i=1;
while (i<=n)
  {
     printf ("Hello\n");
     i++;
     n++;
  }
```

Explain the logical mistake that the programmer made.   3

c)   Explain do-while loop with an example.   3

4.   a)   What is the use of the function in C ? Explain actual argument and formal argument used in function calling process with an example.   2 + 3

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b)   Suppose a function in C is defined as follows :

```
int f(int x, int y)
{
    return 2*x + y;
}
```

Determine the values of x and y after executing following C-code :

```
int x=2, y=6;
    y=f(y,x);
    x=f(y,x);                                    5
```

5.   a)   Write a program to compute the value of $f(x)$ for a given real number x where

$$f(x)=\begin{cases} x-1 & \text{for} & x<1 \\ 1-x & \text{for} & 1\leq x<2 \\ 2-x^2 & \text{for} & x\geq 2 \end{cases}$$

                                                                  6

b)   Suppose i, j and k are three integer variables. Consider an expression in C as follows :

$$k=(i>10)\ ?\ j--\ :\ ++j;$$

What are the values of k and j after executing the above expression if

(i)   initial values of i = 12 and j = 8 ?

(ii)   initial values of i = 8 and j = 8 ?   4

6.   a)   Consider the following stack, where stack is allocated N = 5 memory cells.

STACK : A, B, C

Stack Top is pointing to C.

Determine the stack as the following operations take place sequentially :

(i)   PUSH (STACK, X)   (ii)   PUSH (STACK, Y)

(iii)   PUSH (STACK, Z)   (iv)   POP (STACK)

(v)   POP (STACK)   (vi)   PUSH (STACK, S)   4

b)   What is the difference 'Stack' and 'Queue' data structures ?   2

c)   Write the following program segment using 'for' loop :

```
int count=0; i=1;

float a;

next : scanf("%f",&a);

    if(a>0)

        count++;

    i++;

    if(i<=250)

        go to next;                                    4
```

7.   a)   Write a program to read a set of numbers $x_1, x_2, \ldots x_n$ and store it in an array. Add all the numbers from the array and display the result.   5

b)   Show the output produced by the following program segment :

```
int i=1;

printf("%d\n", i- - +1);

printf("%d",i);                                        2
```

c)   What is the output of the following program segment ? Assume i, j and k are integer variables —

```
i = 7, j;

j = 6 +(i=2·5);

printf("%d\t%d", i, j);                                3
```

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