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Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **2391**

Unique Paper Code : **2371401** **F-4**

Name of the Paper : **Statistical Computing Using C**

Name of the Course : **B.Sc. (H) Statistics**

Semester : **IV**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

All questions are compulsory.

Attempt all parts of a question in continuation.

1. Attempt any *ten* parts : 10×3=30

(*i*) Write assignment statements in C for the following :

(*a*) $t = x^2 + \log_{10}\left(\frac{x}{y}\right)$

(*b*) $z = \frac{1}{2} e^{-\frac{x^2}{2}}$

(*ii*) What are function prototypes in C ? What is their purpose ? Illustrate with example.

(*iii*) What is the result of execution of the following statement :

```
int x, y, z;
z =(x = 10,  y = 20, x + y)
```

P.T.O.

(*iv*) Define a macro with arguments to compute value of the probability density function

$f(x, A, B, C) = A\, e^{-(x-B)/C}$.

(*v*) Fill in the blanks :

(*a*) A variable declared inside a function is called ..... .

(*b*) A function that calls itself is known as a ..... function.

(*c*) The parameters in a function definition are called ..... parameters.

(*d*) Array elements are stored in ..... memory locations.

(*e*) The number of bytes of memory occupied by the array int *x*[3][6] is ..... .

(*f*) An array created using malloc(....) function at run-time is referred to as ..... array.

(*vi*) What is the output of the following program segment ?

```
int x = 10, y = 20, k;

k = x < y;

printf("Ist = %d\nIInd = %d\n", k, x > y);
```

(*vii*) State the size in bytes and range for any three data types in C.

(*viii*) Distinguish between local and global variables in C.

(*ix*) What are various storage classes in C ? Discuss any *one* of them.

(*x*) Consider the following program segment and assume the addresses of *x*, *y*, *px*, *py* to be 1000, 2000, 3000, 4000 respectively :

```
int x = 11, y = 22, * px * py;
px = &x; py = &y;
```

Find the value of each of the following expressions :

(*a*) (* *px*) + +

(*b*) – – (* *py*)

(*c*) * *px* + (* *py*)

(*xi*) State whether the following statements are True *or* False :

(*a*) ANSI C treats the variables count and count to be same.

(*b*) All static variables in C are initialized to zero.

(*c*) The modulus operator % can be used only with integers.

(*d*) A block is marked in C within a pair of ( ).

(*e*) Accessing an array outside its range causes a compile-time error.

(*f*) A function in C can return only an integer value.

2. Attempt any *two* parts : 2×5=10

(*a*) Discuss how initial values can be assigned to two-dimensional arrays with the help of examples.

(*b*) What are different types of integer constants ? What are long integer constants ? How can they be written ?

(*c*) Explain with example, what precautions should be taken when using macros with argument.

P.T.O.

3. Explain the output of the following programs, using the information provided in comments within the code, if any. (Attempt any TWO parts) : 2×5=10

(a)
```
#include<stdio.h>
#include<stdlib.h>
void main( )
{
    char*QR[4]=
        {"January-March",
        "April-June",
        "July-September",
        "October-December"};
    int i, no;
    /*    Assume that call to rand( ) returns 346    */
    no=rand( )%4;
    for(i=0; i<=no; i++)
        printf("%4d%20s\n",i,QR[i]);
}
```

(*b*)
```
#include<stdio.h>

void main( )

{

    int Nos[10]={0. 1. 2. 3. 4. 5. 6. 7. 8. 9};

    int NewNos[10];

    int i. j;

    i=j=0;

    while(Nos[i++]!=9);

    while(--i>=0)

        NewNos[j++]=Nos[i];

    printf("The Nos:\n");

    for(i=0;i<j;i++) {

        printf("(%2d.",Nos[i]);

        printf("%2d)\n",NewNos[i]);
```

(*c*)
```
#include<stdio.h>

void main( )

{

    int i=0,j,k,x=0;

    for(i=1; i<5; i++)

    for(j=0; j<i; j++) {

        k=(i + j - 1);

        if(k % 2 == 0)

                x += k;

        else

                x --;

        printf("%d ",x);

    }

printf("\nx=%d",x);

}
```

4. Attempt any *two* parts : 2×4½=9

(*a*) Write a C program to fit a binomial distribution B(x; n, p) to the given data $\{(x_i, f_i) \mid i = 1, 2, ..., n\}$.

(*b*) Write a C program to draw a random sample of size n from a gamma (k, λ) distribution having shape parameter k and scale parameter λ, making provision for user-input values of $\lambda > 0$ and positive integers n, k.

(*c*) Write a general C program to compute and display the roots of quadratic equation $ax^2 + bx + c = 0$, with provision for user input of the values of coefficients a, b and c.

5. Attempt any *two* parts : 2×8=16

(*a*) Develop a function to calculate coeficient of correlation $r(x, y)$ from data $\{(x_i, y_i) \mid i = 1, 2, ..., n\}$ given on X and Y. Hence, using the function, develop a program to compute multiple correlation coefficient of X on Y and Z.

(*b*) Develop a function to sort an array of integers into the ascending order. Hence, write a program to generate 25 uniform random numbers (integers) in the range [20, 90] and using the function developed, compute sample median.

(*c*) Develop functions to :

(*i*) Read/Input a matrix and

(*ii*) Write/Output a matrix of order $m \times n$.

Hence, using the functions, write a program to perform matrix multiplication.