

**2020**

**STATISTICS — HONOURS**

**Paper : CC-7**

**(Statistical Computing and Numerical Analysis using C Programming)**

**Full Marks : 50**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**Group - A**

1. Answer *any ten* from the following : 1×10
- (a) Give one real life use of linear interpolation.
  - (b) Give two C keywords.
  - (c) Give an example of a transcendental equation.
  - (d) If  $f(x) = 0$ ,  $1 < x < 3$  has a root  $x_0 = 1.5$ , sketch a graph of  $y = f(x)$ .
  - (e) Give an example of a transcendental equation having infinite number of roots.
  - (f) What is error tolerance in the context of iterative solution of equations?
  - (g) “Number of iterations increases with the increase in error tolerance in the context of iterative solution of equations”— True or False?
  - (h) For which type of the function  $f$ , you can not apply Newton-Raphson method to solve  $f(x) = 0$ .
  - (i) Give an example of a transcendental equation with exactly two roots.
  - (j) Justify or correct the statement : “C is a machine language”.
  - (k) If  $\pi$  is approximated by 3.1416, find the percentage error.
  - (l) Give the structure of any binary operator in C.
  - (m) Which of the following are valid identifiers : (i) sol\_p (ii) #sol.pt (iii) sol.p.?
  - (n) If a number  $x$  is rounded to five decimal points giving percentage error of .021%, what is the absolute error?
  - (o) Give an example of an exit-controlled loop and give the structure.

**Please Turn Over**

**Group - B**Answer **any four** the questions.

5×4

2. What output is obtained, when you execute the following C program block?

```
x = 577.299;
x = x - 1000;
printf ("%6.1f", x);
```

Justify the output and suggest modifications if you expect errors.

3. Prove that  $f(4)$  can be expressed as  $f(3) + \Delta f(2) + \Delta^2 f(1) + \Delta^3 f(1)$ .

4. If an operator is defined as  $\mu f(x) = \frac{\left\{ f\left(x - \frac{h}{2}\right) + f\left(x + \frac{h}{2}\right) \right\}}{2}$ ,  $h$  being the interval of differencing, show that the operator is a linear operator.

5. If the first derivative at a point  $x_k$ , is approximated by  $f'(x_k) = [f(x_k + h) - f(x_k - h)]/(2h)$ , find the error term up to first order.
6. Given that  $f(0) = 1, f(1) = 3, f(3) = 55$ , find the Lagrange polynomial of appropriate degree, which fits the given data.
7. Write a program in C to compute the proportion of even numbers among the first 60 natural integers.

**Group - C**Answer **any two** questions.

8. (a) Write a program in C to find the proportion of the students with marks in the interval [50, 70], when the marks of 20 students in a class are provided.
- (b) Assuming interval of differencing as unity, prove that  $(-1)^m B(m+1, n) = \Delta^m \left( \frac{1}{n} \right)$ , where  $m$  is an integer,  $B(.,.)$  is the Beta function with integer arguments. 5+5
9. (a) Write a C program to find the median of any given set of 15 numbers using a function with the data array as argument.
- (b) Find the iterative methods based on the Newton-Raphson method for finding  $e^N$ , where  $N$  is a positive real number. 6+4
10. (a) Write a C function to calculate the mean of  $n$  ( $>100$ ) numbers used for looping structure, where  $n$  is not specified.
- (b) Describe how Lagrange's interpolation formula can be used to find the approximate root of a given equation. 6+4
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