

B.Sc. Semester - 5 (CBCS) Examination

Oct/Nov - 2025 (NEW COURSE)

Programming in C and Numerical Analysis -1(Core)

Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Que.1(A) Attempt any TWO. (10)

- (i) Explain types of constants in C. Also, differentiate between a constant and a variable.
- (ii) Explain type conversion in assignments in C with the help of suitable example.
- (iii) Explain nested *if else* statement.

Que.1(B) Attempt any ONE. (04)

- (i) What do you mean by a header file in C? Explain its purpose with at least 2 examples.
- (ii) Write a program to display the smallest number amongst the three real numbers input by user through keyboard.

Que.2(A) Attempt any TWO. (10)

- (i) Draw the flow chart of *for* loop and explain it with an example.
- (ii) Write a short note on user defined functions in C.
- (iii) Write a program using *do-while* loop to print all the positive divisors of the given positive integer and also count them.

Que.2(B) Attempt any ONE. (04)

- (i) Differentiate between *continue* and *break* statements.
- (ii) Differentiate between *signed* and *unsigned int* and *float* data types.

Que.3(A) Attempt any TWO. (10)

- (i) Explain Macros with argument.
- (ii) Write a short note on arrays in C programming.
- (iii) Write a short note on preprocessor directives in C.

Que.3(B) Attempt any ONE. (04)

- (i) Explain two dimensional array initialization in C programming.
- (ii) Write a program to check whether the entered 3×3 square matrix is symmetric or not.

Que.4(A) Attempt any TWO. (10)

- (i) Explain Gauss elimination method in detail, on a general system of 3 simultaneous linear equations in 3 unknowns.
- (ii) Explain LU decomposition method to solve a general system of 3 simultaneous linear equations in 3 unknowns.
- (iii) Using the principle of least squares fit a linear equation $y = ax + b$ to a set of n ordered data points $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$ for some $\in \mathbb{N}$.

Que.4(B) Attempt any ONE. (04)

- (i) Fit an exponential curve $y = a e^{bx}$ to the following data as per the method of least square.

x	1	2	3	5	7	8
y	5.77	9.51	15.69	42.64	115.90	191.09

- (ii) Write names of indirect methods for solving a system of linear simultaneous equations. Also explain which method is more rapid and why?

Que.5(A) Attempt any TWO.

(10)

- (i) State and derive Gregory Newton's forward interpolation formula.
- (ii) In usual notation, show that $= \frac{1}{h} \left\{ \Delta - \frac{\Delta^2}{2} + \frac{\Delta^3}{3} - \frac{\Delta^4}{4} + \dots \right\}$.
- (iii) Interpolate the missing values a and b in the following table:

x	-2	-1	0	1	2	3	4	5
y	-68	2	6	-2	a	42	b	1766

Que.5(B) Attempt any ONE.

(04)

- (i) Without creating the difference table, find the value of $\Delta^4 y_0$ and $\nabla^4 y_4$ from the data given below:

$$y_0 = -3, \quad y_1 = -4, \quad y_2 = -3, \quad y_3 = 24, \quad y_4 = 125.$$

- (ii) Express the polynomial $p(x) = 2x^5 - 5x^3 + 10x^2 - x - 8$ in factorial notations.
