

Name of Course	: CBCS B.Sc. (H) Mathematics
Unique Paper Code	: 32357503
Name of Paper	: DSE- I, C++ Programming
Semester	: V
Duration	: 3 hours
Maximum Marks	: 75 Marks

Attempt any four questions. All questions carry equal marks

1. The electricity board charges the following rates to the domestic users for the consumption of electricity:

	Sanctioned load ≤ 2 K.W.	Sanctioned load > 2 K.W.
For the first 100 units	Rs. 3.0	Rs. 4.0
101-300 units	Rs. 3.5	Rs. 4.5
Beyond 300 units	Rs. 4.0	Rs. 5.0

All users charged a minimum of Rs. 200/- as meter charge. Write the appropriate code in C++ to calculate the Total charges based on units consumed and sanctioned load.

2. Write a function in C++ using the one dimensional array to calculate the following quantity:

$$\sqrt{\frac{|\sum_{i=1}^n (x_i - \bar{x})^3|}{(n-2)}}$$

where,

x_i denotes the data stored in the cells of array

\bar{x} denotes the average of the data stored in the array

n denotes the number of data stored in the array and $n > 2$.

3. Consider a system of linear equations

$$AX = B$$

where A is a coefficient matrix of order 3×3 , X is a column vector of unknown variables of order 3×1 and B is a known column vector of order 3×1 . Write a program that performs following tasks

- Check whether the given system of linear equations has a solution. If it has a solution then perform the next point otherwise print some messages and exit.
- Check the given system of linear equations has infinite solutions or unique solution. If the system has a unique solution, then perform point (c) otherwise print some messages and exit.

- iii. Find the solution of the given system of linear equations using Cramer's method.
4. Write a C++ program that performs the following tasks by defining functions
 - i. Input a ten-digit integer, then separate all digits and store them in a one-dimensional array.
 - ii. Then form a function *RemoveZero*(array, sizeofarray) that identifies the cell location of all zeros and eliminates them from the array. Because this operation changes the effective size of the array, *RemoveZero*, should take the effective size as a reference parameter and adjust it accordingly.
 - iii. After point (ii), reverse the position of all elements of the array and then find the cell position of the largest and smallest numbers.
5. Write a program to find the elements of $U(8)$, where $U(8)$ is the group under multiplication modulo 8 having elements less than and co-prime to 8. The program then displays the element of $U(8)$. Also the program has a function called Calay table which takes elements of $U(8)$ as argument in one dimensional array form and displays the Calay's table for $U(8)$ in grid form.
6. Write a program that gives values of n between 1 to 100 for which number of the type $3^{n-1} + 2$ is prime or the product of two prime numbers. Moreover, it should find and display the prime factorization of $3^{12-1} + 2$ and also checks if it is a palindrome or not.