ICP Minor Project 2023-24

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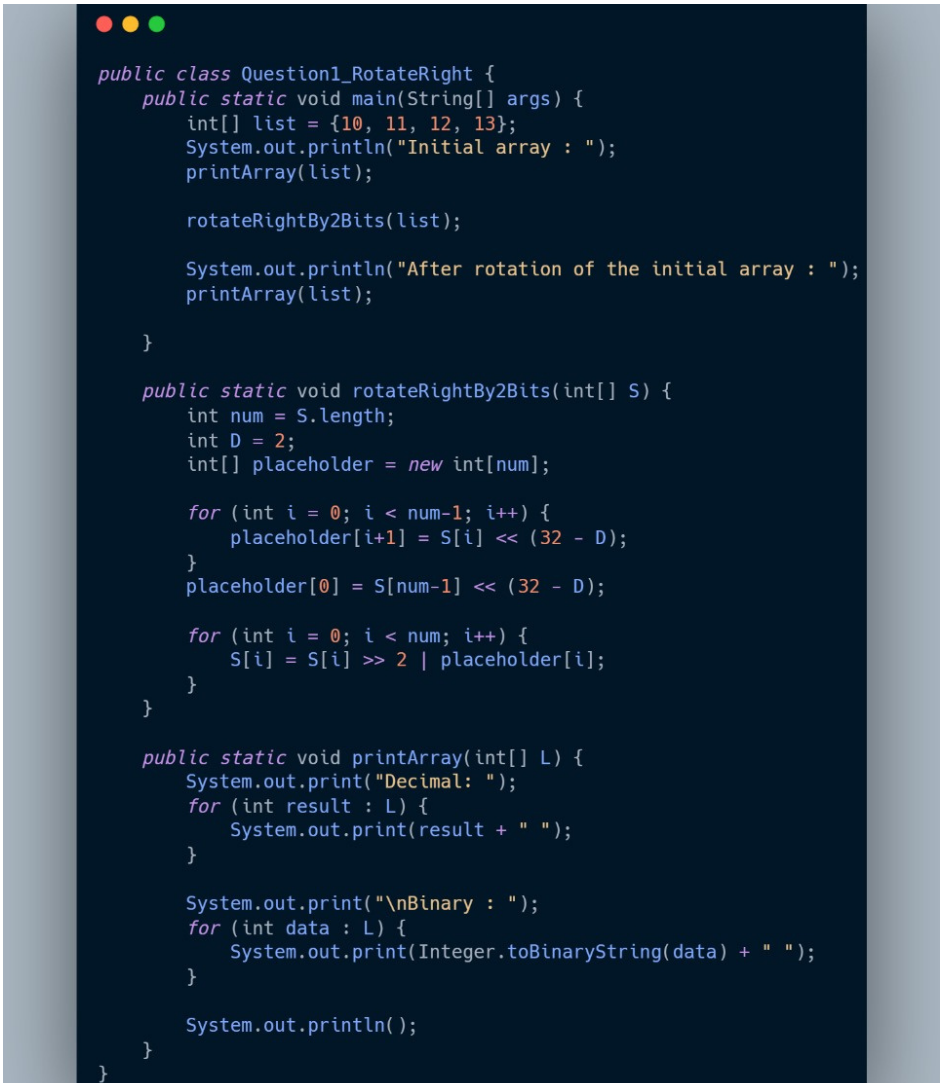
QUESTION- 1

There are 4 integers in successive memory locations in an array. Write a program to rotate the 4 integers to the right by 2 bits according to the procedure given below. Print the original and resulting array in both integer and binary string form. To print binary String you can use the following library method:

CODE SNIPPET



```java
public class Question1_RotateRight {
    public static void main(String[] args) {
        int[] list = {10, 11, 12, 13};
        System.out.println("Initial array : ");
        printArray(list);

        rotateRightBy2Bits(list);

        System.out.println("After rotation of the initial array : ");
        printArray(list);

    }

    public static void rotateRightBy2Bits(int[] S) {
        int num = S.length;
        int D = 2;
        int[] placeholder = new int[num];

        for (int i = 0; i < num-1; i++) {
            placeholder[i+1] = S[i] << (32 - D);
        }
        placeholder[0] = S[num-1] << (32 - D);

        for (int i = 0; i < num; i++) {
            S[i] = S[i] >> 2 | placeholder[i];
        }
    }

    public static void printArray(int[] L) {
        System.out.print("Decimal: ");
        for (int result : L) {
            System.out.print(result + " ");
        }

        System.out.print("\nBinary : ");
        for (int data : L) {
            System.out.print(Integer.toBinaryString(data) + " ");
        }

        System.out.println();
    }
}
```

Question1_RotateRight Documentation

The code above defines a class Question1_RotateRight with a main method and two additional methods: rotateRightBy2Bits and print Array.

The main method initializes an array list with values [10, 11, 12, 13], prints the initial array, performs a right rotation on the array by 2 bits using the rotateRightBy2Bits method, and then prints the array again.

1) rotateRightBy2Bits Method:

The method takes an array S as input and rotates its elements to the right by 2 bits.

It calculates the length of the array and sets D to 2 (the number of bits to rotate).

It creates a temporary array placeholder to store the rotated bits temporarily.

The first loop iterates over the array, shifting each element to the left by (32 - D) bits and stores the result in the placeholder array.

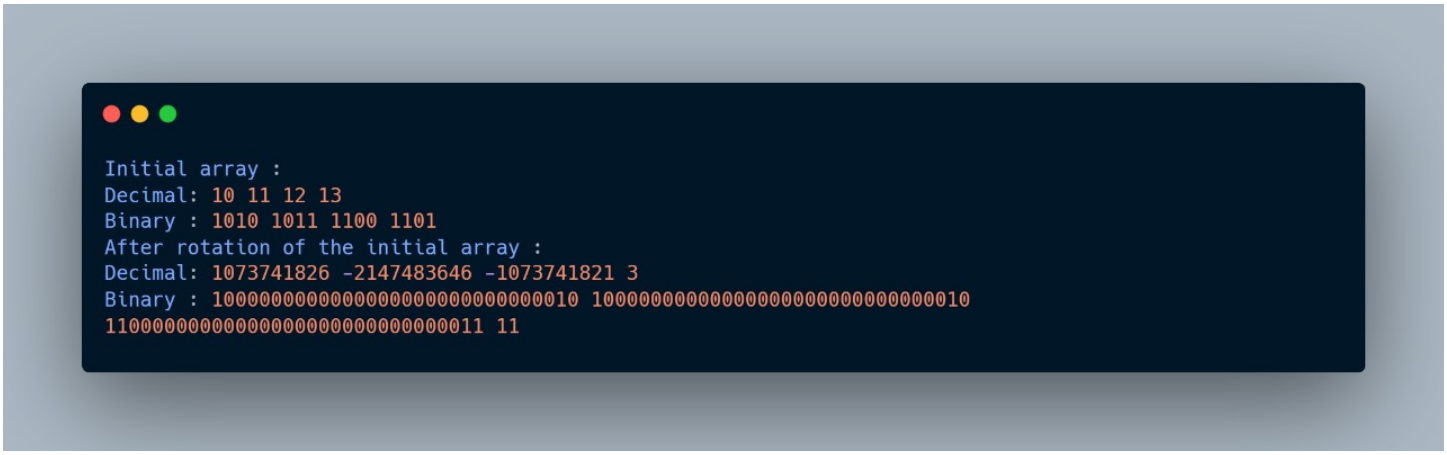
The last element is then rotated and stored in the first position of the placeholder array.

Finally, the second loop updates the original array S by right-shifting each element by 2 bits and OR-Ing it with the corresponding value from the placeholder array.

2)print Array Method:

This method takes an array L as input and prints its elements in both decimal and binary format.

OUTPUT SNIPPET



OUTPUT EXPLANATION

The decimal values in the "After rotation" section represent the result of rotating each element in the initial array to the right by 2 bits.

The binary values show the binary representation of the corresponding decimal values after rotation.

QUESTION 2

Given a decimal integer (n) and base value (b). Write a Java program to convert n to the corresponding target value n’ such that:

(n)10 = (n’)b

As the target value may contain both alphabets and digits, it is better to use String] Use a method convertToAnyBase() with the following header:

CODE SNIPPET

```java
import java.util.Scanner;
public class Question2_ConvertToAnyBase {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the value of N :");
        int N = sc.nextInt();
        System.out.println("Enter the value of B :");
        int B = sc.nextInt();
        sc.close();
        String res = convertToAnyBase(N , B );
        System.out.println(res);
    }

    public static String convertToAnyBase(int N, int B)
{       char[] character = new char[26];
        for (int i = 10; i <= 35; i++) {
            character[i - 10] = (char) ('A' + i - 10);
        }

        String result = "";
        while (N != 0) {
            int r = N % B;
            N = N / B;
            if (B > 10 && r > 9) {
                result = character[r - 10] + result;
            } else {
                result = r + result;
            }
        }

        return result;

    }
}
```

Question2_ConvertToAnyBase Documentation

Code Explanation:-

This program allows users to convert a given decimal number (N) to a specified base (B). The conversion supports bases up to 36, including alphanumeric characters for bases greater than 10.

Usage:-

The user is prompted to input the value of N (decimal number) and B (target base).

The program then utilizes the convertToAnyBase method to perform the conversion.

The result is displayed as output.

convertToAnyBase Method:-

Parameters:-

N (int): The decimal number to be converted.

B (int): The target base for the conversion.

Returns:-

String: The converted number as a string.

Method Steps:-

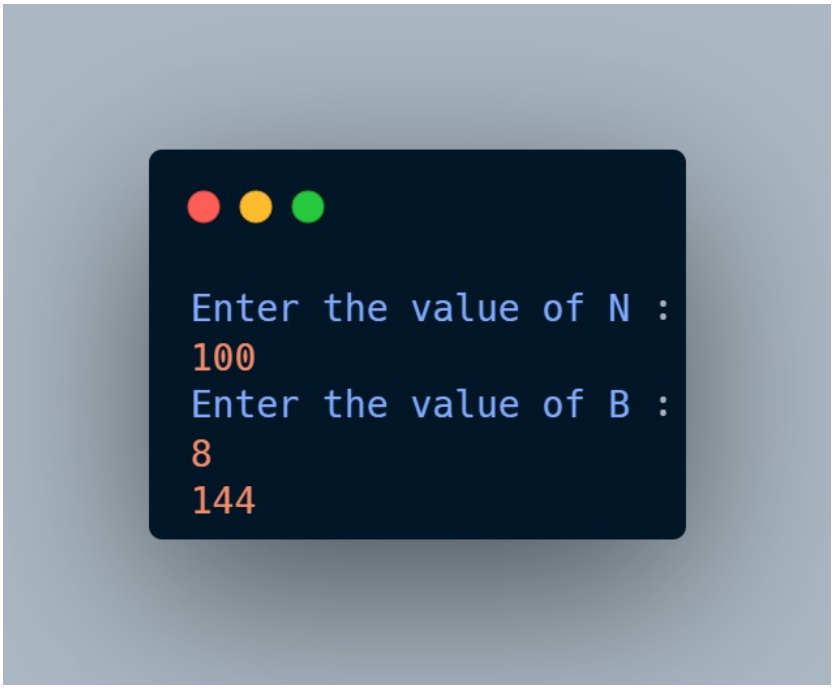
An array of characters (character) is initialized to store characters for bases greater than 10 (up to base 36).

The decimal number (N) is iteratively divided by the target base (B), and remainders are used to construct the converted result.

If the target base is greater than 10 and the remainder is greater than 9, alphanumeric characters from the character array are used.

The final result is returned as a string.

OUTPUT SNIPPET



Output Explanation :-

1)The program prompts the user to enter the value of N (which is 100 in this case) and B (which is 8 in this case).

2)The convertToAnyBase method is then called with N=100 and B=8.

3)Inside the method, the number 100 is converted to base 8, and the result is calculated as "144".

The final result "144" is then printed as the output.

So, the output of the code for the provided input (N=100, B=8) is "144".