# BAHRIA UNIVERSITY,
# (Karachi Campus)
## Department of Software Engineering
Assignment #03– Spring 2022

# Complex Engineering Problem

COURSE TITLE: D&AA COURSE CODE: CSC-321 Class: BSE 4
Shift: Morning
Course Instructor: ENGR. BUSHRA FAZAL KHAN Assignment Date: 08- Jun -2022
Max. Marks: 4 Points(CLO3) Assignment Due: 20-Jun-2022

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Question No 1

McDonalds sells a chicken nugget in only boxes of 6 pieces, 9 pieces, or boxes of 20 pieces. Therefore, you can't buy exactly 7 nuggets, or exactly 10 nuggets, etc. Design an algorithm and check whether it is possible to buy exactly n nuggets.

Question No 2

Sarim has 4096 tennis balls and each tennis ball has an positive integer with base 10 written on it, they all are distinct. He wants to sort them, instead of using conventional techniques he chose to devise his own. His technique comprise of following steps:

(a) Calculate the $\log_2(4096)$ i.e. $\log_2(4096) = 12$ i.e. $(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B)$

(b) Re-write all the numbers on the balls with base 12 e.g. 10 will become $A$, 24 will be rewritten as 20 and so on ..

(c) Now first sort all the balls with the most significant digit (MSD) using counting sort and group those who have the same MSD.

(d) Repeat this on each group until u reach the least significant digit (LSD)

(e) Claim that the resultant is sorted

Write psudo-code and prove that the algorithm is correct.

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**Solution: -**

**Question 1: -**

**Algorithm puttingNuggetsInABox(**int n**): -**

**//Input: -** Number of nuggets n to put in the boxes of 6 nuggets, 9 nuggets or 20 nuggets

**//Output: -** Boolean value which specifies the n nuggets can be placed in the above specified boxes or not.

```
condition = false;
if (n < 1) {
        print n + “nuggets can not be placed in the specified boxes”;
        return false;
}
if ((n % 6 == 0) || (n % 9 == 0) || (n % 20 == 0)) {
        print n + “nuggets can be placed in the specified boxes”;
        return true;
}
if (condition == false && n > 20) {
        condition = puttingNuggetsInABox(n - 20);
        if (condition == true) {
                print n + “nuggets can be placed in the specified boxes”;
        }
}
if (condition == false && (n > 9 && n < 20)) {
        condition = puttingNuggetsInABox(n - 9);
        if (condition == true) {
                print n + “nuggets can be placed in the specified boxes”;
        }
}
if (condition == false && (n > 6 && n < 9)) {
        condition = puttingNuggetsInABox(n - 6);
```

```
        if (condition == true) {
                print n + “nuggets can be placed in the specified boxes”;
        }
}
return condition;
```

**Question 2: -**

**Algorithm customSorting(char[] tennisBalls):-**

```
//Input: - An array of the labels of 4096 tennis balls tennisBalls.
//Output: - A sorted array sortedTennisBalls
int logValue = Math.log(4096) //returns 12
int aValue = 10,bValue = 11,inc = 0;
for (int I = 0;I < tennisBalls.length;I++) {
        if (I == aValue) {
                tennisBalls[i] = ‘A’;
                aValue = aValue + 10;
        }
        If (I == bValue) {
                tennisBalls[i] = ‘B’;
                bValue = bValue + 10;
        }
        Else {
                tennisBalls[i] = ‘’+inc;
                inc++;
        }
}
radixSort(tennisBalls);
for (int I = 0;I < tennisBalls.length;i++) {
        print tennisBalls[i];
}
```