Assignment – 2 - ANSWERS

Q1. Write pseudocode of the following:

i. Bucket Sort

Ans:

```
BUCKET_SORT(A, n)
$declare\ bucket[n]$
$for\ i \leftarrow 1\ to\ A.length$
$do$
    $bucket[\ \lfloor n * A[i] \rfloor\ ] = SUB\_ARRAY(A[i], n, bucket)$
$end\ for$
$for\ j \leftarrow 1\ to\ bucket.length$
$do$
    $INSERT\_SORT(bucket[j])$
$end\ for$
$A = JOINT\_SUB\_ARRAY(bucket[j])$
$return\ A$
```

```
SUB_ARRAY(x, n, B)
$if\ B[\lfloor n * x \rfloor]\ is\ empty\ then$
    $declare\ dynamic\ array\ C[\ ]$
    $return\ C$
$else$
    $C[\ ] \leftarrow B[\lfloor n * x \rfloor]$
    $C.add(x)$
    $return\ C$
$end\ if$
```

------------- x --------------

ii. Counting sort

Already given in the nodes

iii. Radix sort

Ans:

```
RADIX_SORT(A, n)
$\text{max} \leftarrow GETMAX(A)$
$for\ exp \leftarrow 1\ to\ max/exp\ \ > 0$
$do$
        $COUNTSORT(A, n, exp)$
        $exp \leftarrow exp * 10;$
$end\ for$
```

NOTE is COUNTSORT is specifically designed for the RADIX_SORT; don't use it for general purpose

```
COUNTSORT(A, n, exp)
declare $B[\ n\ ]$
declare $C[\ 10\ ]$
for $i \leftarrow 1$ to $10$
do
        $C[i] = 0;$
end for
for $j \leftarrow 1$ to $n$
do
        $C\left[\left(\frac{A[i]}{exp}\right)\%10\right] = \ +1$
end for
for $k \leftarrow 2$ to $10$
do
        $C[k] = C[k-1] + C[k]$
end for
for $i \leftarrow n$ down to $1$
do
        $B\left[C\left[\left(\frac{A[i]}{exp}\right)\%10\right]\right] = A[i]$
        $C\left[\left(\frac{A[i]}{exp}\right)\%10\right] = \ -1$
end for
for $i \leftarrow 1$ to $n$
do
        $A[i] = B[i]$
end for
```

Q2. show what it will print of screen if printfy(30), display only output, don’t claim to prove it.

```
printfy(n)
    if(n>0)
        printfy(⌊n/2⌋)
   if n is odd then
     print ‘0’
   else
     print ‘1’
```

Ans:

100001

Q3. Explain the run time complexity

1. Worst case complexity

Ans:

Defined in the nodes

2. Average case complexity

Ans:

Defined in the nodes