Yash Mahajan SE IT B 04

Assignment Test - 2 (DSA)

1. Write an algorithm for Merge sort and comment on it's complexity

Algorithm :-

MERGE (ARR, BEG, MID, END)

Step 1 :- SET I = BEG, J = MID+1, INDEX = 0
Step 2 :- Repeat while (I <= MID) AND (J <= END)

IF ARR[I] < ARR[J]
SET TEMP[INDEX] = ARR[I]
SET I = I+1
ELSE
SET TEMP[INDEX] = ARR[J]
SET J = J+1
END LOOP
[END IF]
SET INDEX = INDEX+1
[END OF LOOP]

Step 3: IF I > MID
REPEAT while J <= END
SET TEMP[INDEX] = ARR[J]
SET INDEX = INDEX+1
SET J = J+1
[END OF LOOP]

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```
ELSE
    REPEAT while I <= MID
     SET TEMP[INDEX] = ARR[I]
     SET INDEX = INDEX + 1
      SET  I  = I + 1
   [END LOOP]
   [END of IF]
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Step 4: - SET K = 0
Step 5: - Repeat while K < INDEX
SET ARR[K] = TEMP[K]
SET K = K + 1
[END OF LOOP]
Step 6: - END.

MERGE_SORT (ARR, BEG, END)

Step 1 : - IF (BEG < END)
SET MID = (BEG + END)/2
CALL MERGE_SORT (ARR, BEG, MID)
CALL MERGE_SORT (ARR, MID+1, END)
MERGE (ARR, BEG, MID, END)
[END IF]

Step 2 : - END.

The runtime complexity in mergesort for all the cases, i.e. best, worst and

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average cases is the same i.e., ~~Ω(n) to~~ O(nLogn). Even though it has an optimal runtime complexity, it has an additional space complexity of O(n) for the temperory array TEMP.

2. Sort the following numbers using Radix sort

Unsorted numbers :-

56, 842, 67, 214, 635, 84, 65, 7, 61, 125, 945

Sorting the numbers according to ~~third~~ last digits.

(061), (842), (084, 214), (635, 065, 125, 945), (056), (067, 007)

~~Sorting~~

061, 842, 084, 214, 635, 065, 125, 945, 056, 067, 007.

Sorting the numbers according to second last digit.

(007), (214), (125), (635), (842, 945)

(056), (065, 067), (084)

(061, 065, 067)

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007, 214, 125, 635, 842, 945, 056,
061, 065, 062, 689.

Sorting the numbers by their third last digits.

(007, 056, 061, 065, 062, 089), (125),
(214), (635), (842), (945)

∴ The sorted list is

007, 56, 61, 65, 62, 89, 125, 214, 635,
842, 945
~~635~~