Data Structure & Algorithm.
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Assignment 7.
DATE >0>1389848.

Q1,   64, 32, 79, 83, 67, 46, 96, 55, 68, 12.

a) Insertion Sort :

32, 64, 79, 83, 67, 46, 96, 55, 68, 12.

32, 64, 67, 79, 83, 46, 96, 55, 68, 12.

32, 46, 64, 67, 79, 83, 96, 55, 68, 12

32, 46, 55, 64, 67, 79, 83, 96, 68, 12

32, 46, 55, 64, 67, 68, 79, 83, 96, 12

12, 32, 46, 55, 64, 67, 68, 79, 83, 96

b) Shell sort.

64, 32, 79, 83, 67, 46, 96, 55, 68, 12.

5.   46, 32, 79, 83, 67, 64, 96, 55, 68, 12.

46, 32, 55, 83, 67, 64, 96, 79, 68, 12.

46, 32, 55, 68, 67, 64, 96, 79, 83, 12

3   46, 32, 55, 68, 12, 64, 96, 79, 83, 67

46, 12, 55, 68, 32, 64, 96, 79, 83, 67.

46, 12, 55, 67, 32, 64, 68, 79, 83, 96.

1.   12 46 55 67, 32, 64, 68, 79, 83, 96.

12 32 46 55 67 64, 68, 79, 83, 96.

12 32 46 55 64 67 68, 79, 83, 96

(c) Merge Sort. $9/2 = 4.$

64, 32, 79, 83, 67, 46, 96, 55, 68, 12.

64, 32, 79, 83, 67   46, 96, 55, 68, 12

64, 32, 79   83, 67   46, 96, 55   68, 12

64, 32   79   83   67   46, 96   55   68   12

64   32   46   96

32, 64   79   83   67   46, 96   55   68   12

32, 64, 79   67, 83   46, 55, 96   12, 68

32, 64, 67, 79, 83   12, 46, 55, 68, 96

12, 32, 46, 55, 64, 67, 68, 79, 83, 96   #

(d) Radix Sort.

1nd digit	0			2nd digit	0					Sort.
	1				1	12				12
	2	32	12		2					32
	3	83			3	32			⇒	46
	4	64		⇒	4	46				55
	5	55			5	55				64
	6	46	96		6	64	67	68		67
	7	67			7	79				68
	8	68			8	83				79
	9	79			9	96				83
										96 #

	0	1	2	3	4	5	6	7	8	9	10	11	12

Q3.   64, 12, 68, 23, 97, 38, 81, 76, 55, 32, 48, 29, 46.

pivot=64   46, 12, 68, 23, 97, 38, |64| 76, 55, 32, 48, 29, 81
                                      pivot

swap   46, 12, 68, 23, 97, 38, 29, 76, 55, 32, 48, |64| 81.
       i ⟶ i↰   ⤴ j

swap   46 12, 48, 23, 97, 38, 29, 76, 55, 32, 68, |64| 81
          i ⟶ i↰   → j ← j

swap   46 12 48 23 32, 38, 29, 76, 55, 97, 68, |64| 81
               i ⟶ i→j ← j

swap   46 12 48 23 32 38 29 55 76 97 68 |64| 81
                           j   i↰   ⤴

        46 12 48 23 32 38 29 55 [64] 97 68 76 81.
                                j   i

        23 12 48 |46| 32 38 29 55 [64] 68 81 76 97
     left   pivot↰   i-1   pivot⤴

pivot=46, 81   23 12 48 29 32 38 |46| 55 [64] 68 76 81 97
           i ⟶ i ←   j

        23 12 38 29 32 48 |46| 55 [64] 68 76 81 97
           i ⟶ j i↰

        23 12 38 29 32 [46] 48 55 [64] 68 76 81 97

pivot=32   23 12 |32| 29 38 [46] 48 55 [64] 68 76 81 97
                 ↑ ↰
                pivot

        23 12 29 |32| 38 [46] 48 55 [64] 68 76 81 97

        12, 23, 29, 32, 38, 46, 48, 55, 64, 68, 76, 81, 97   #

Q3. Bucket Sort.

8, 7, 4, 2, 5, 5, 2, 4, 5, 7, 8

```
0
1
2  | | |
3
4  | | |          ⇒ 2, 2, 4, 4, 5, 5, 5, 7, 7, 8, 8  #
5  | | | |
6
7  | | |
8  | | |
9
```

Q4. External sort

T_1 $\underline{10, 1, 5, 2}$, $\underline{6, 8, 4, 10}$, $\underline{6, 6, 2, 4}$, $\underline{1, 8, 7, 3}$

T_2

T_3 | 1, 2, 5, 10 | 2, 4, 6, 6 |

T_4 | 4, 6, 8, 10 | 1, 3, 7, 8 |
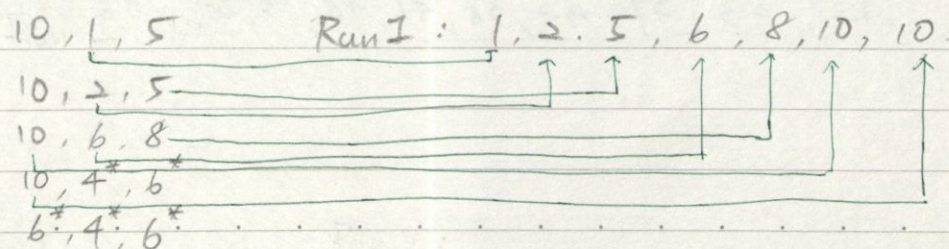

T_1 | 1, 2, 4, 5, 6, 8, 10, 10 |

T_2 | 1, 2, 3, 4, 6, 6, 7, 8 |

T_3 1, 1, 2, 2, 3, 4, 4, 5, 6, 6, 6, 7, 8, 8, 10, 10 #

Q5 Replacement selection

10, 1, 5, 2, 6, 8, 4, 10, 6, 6, 2, 4, 1, 8, 7.

10, 1, 5   Run I : 1, 2, 5, 6, 8, 10, 10.

10, 2, 5

10, 6, 8

10, 4*, 6

6*, 4*, 6*

6 46   Run 2 : 4, 6, 6

6 2* 6

6, 2*, 4*

1*, 2*, 4*

----

1 ≥ 4   Run 3: 1, 2, 4, 7, 8.

8, 2, 4.

8, 7, 4.

Run 1 + 2 + 3
⟹   1, 1, 2, 2, 4, 4, 5, 6, 6, 6, 7, 8, 8, 10, 10
                                                    #

Q6. Decision Tree
        4 item = 4! = >4 leaves.

        depth : $\lceil \log_2 4 \rceil$ = 5   #