mester III (B.Tech)

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Jaypee University of Engineering & Technology, Guna

T-1 (Odd Semester 2021)

18B11CI311- Data Structures

1840
192
2032

Maximum duration: 1 Hour

Maximum Marks: 15

Notes:

1. This question paper has 3 questions.
2. Write relevant answers only.
3. Do not write anything on the question paper except the enrollment number.

3
48
4
192

Q1. Suppose you have given an array $A[N]$, the elements of this array are arranged as $A[0] \le A[1] \le A[2] \le \cdots \le A[N-1]$. Write an efficient recursive algorithm to search an element K in the array A[N]. From your algorithm, derive the recurrence relation and solve the obtained recurrence relation using the backward-substitution method to find the time complexity. Also, discuss the best and worst cases of your algorithm. **[05]**

Q2. Write the algorithm of selection sort. Apply selection sort on the following array: **[05]**

0, 9, 8, 7, 6, 5, 4, 3, 2, 1

Show the output of each of the passes. Also, mention the number of swapping operations required in each pass.

Q3. (a) Assume you have given a square matrix M [ ] [ ], this matrix has a total number of 100 elements. Each element needs 4 bytes of storage. If the base address at M [0][0] is 1840, determine the address at M [4] [8] when the matrix is stored in Row Major Wise. **[02]**

(b) Analyze the time complexity of the following code segments (show all the steps) **[03]**

(i)
```
for(i = 2; i <=n; i = i*i)
{
    for(j=n; j>0; j--)

        printf("JUET");
}
```

(ii)
```
for(i = 1; i <=log(n); i++)
{
    for(j=n; j>0; j--)

        printf("Guna");
}
```

2
4
16
256
|
|

n
n-1
n-2
|
|
0

(iii)
```
for(i = 1; i <=n; i++)
{
    for(j=i; j>0; j--)

        printf("T1");
}
```

for i=

1
2
3
4
|
|
k = log n
n = e^k