

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
 TEST-1 EXAMINATION (FEB 2019)
 B-Tech (2nd SEM)

Course Code: 18B17CI211

Max. Marks: 15

Course Name: DATA STRUCTURES AND ALGORITHMS

Max. Time: 1 HRS

Course Credit: 4

Note: All questions are compulsory. Skip syntax error if there any.

Q1.

[3 x 1 = 3]

- Find the validity of the statement "A $O(n)$ algorithm is $\Theta(1)$ "? Justify your answer.
- Arrange the following given computational complexities into decreasing rate of their growth: $O(\log^2 n)$, $O(n!)$, $O(\log(n!))$, $O(n)$, $O(4^n)$, $O(2^{\log n})$.
- List the possible scenarios in which a linked list can be considered as broken?

Q2. What will be output of following C programs? Justify your answer with proper reason(s). (if required then assume that integer and pointer are of 4 Bytes each)?

[2 x 1½ = 3]

//Program1

```
#include <stdio.h>
#define R 10
#define C 20
int main()
{
    int (*p)[R][C];
    printf("%d", sizeof(*p));
    getchar();
    return 0;
}
```

//Program2

```
#include <stdio.h>
int main( )
{
    static int a[]={10, 20, 30, 40, 50};
    static int *p[]={a,a+3,a+4,a+1,a+2};
    int **ptr = p;
    ptr++;
    printf("%d%d", ptr - p, **ptr);
}
```

Q3. Workout the computational complexity of following given codes (in the "Big-Oh" sense).

Also show your all computational steps.

[2 x 1 = 2]

//Algo1

```
void fun()
{
    for (i=1;i<=n,i++)
    {
        for (j=1;j<=n; j=j+i)
        {
            Printf("Hello");
        }
    }
}
```

//Algo2

```
void fun()
{
    int i, j;
    for (i=1; i<=n; i++)
        for (j=1; j<=log(i); j++)
            printf("Hello");
}
```

Q4.

- a) Write an algorithm with computational complexity $O(\log n)$ to search an element in the sorted array. [2]
- b) Assume that we have a doubly linked list and that we want to add a new node between the second and the third nodes in the list. Redraw the figure so that it shows the insertion. Write an algorithm for the same. [2]
- c) The statements below show some features of “Big-Oh” notation for the functions $f = f(n)$ and $g = g(n)$. Determine whether each statement is **TRUE** or **FALSE**? If **FALSE** then correct the formula. [3]

Statement	TRUE or FALSE?	if FALSE then correct formula is
$O(f + g) = O(f) + O(g)$		
If $g = O(f)$ and $h = O(f)$ then $g = O(h)$		
$5n + 8n^2 + 100n^3 = O(n^4)$		

JUT T1 EXAMINATION FEB 2019