Semester: 3rd
Subject Name: DSA & Code: CS-2001
Branch (s): SCE, SET, SEE

AUTUMN MID SEMESTER EXAMINATION-2022

School of Computer Engineering
Kalinga Institute of Industrial Technology, Deemed to be University
Data Structure and Algorithms
[CS-2001]

Time: 1 1/2 Hours **Full Mark: 20**

Answer any four Questions including Q.No.1 which is Compulsory.
The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. Answer all the questions. [1 × 5]

a) Find out the time complexity of the following function:

```
void func() {
    int i=1, j;
    while(i<=n) {
        for(j=1; j*j<=n; j++)
            printf("Data Structure...\n");
    }
}
```

~~$\Theta(n * \ln n)$~~ $\boxed{O(n * \ln(n))}$

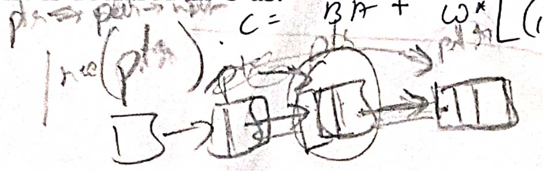
b) Consider a 2-D array arr[3...6, -2...5] requires 4 bytes of memory space for each element of the array. If the array is stored in row-major order having base address 1001, then what will be the address of the array element arr[5, 3]?

$a = BA + w * [n * (i - L_r) + (j - L_c)]$.

$c = BA + w * [(i - L_r) + m * (j - L_c)]$.

c) If the node of a doubly linked list is declared in C as:

```
struct node {
    int data;
    struct node *prev;
    struct node *next; };
```



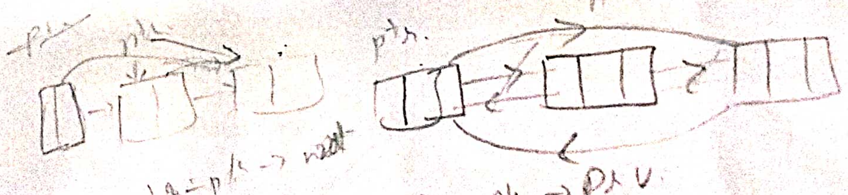
~~ptr->prv~~
ptr=ptr->next
ptr->prev =

and ptr is a pointer pointing to one of the internal nodes of a doubly linked list, then write the required statements to delete the node to which ptr is pointing to without using any other pointer variable.

d) How a singly linked list can be used to represent the following polynomial:
$P(x)=2xy^2z^3+ 3x^2yz^2- 4xy^3z+5x^2y^2+7xy^2z^5+11$

e) A stack is implemented using an array declared in C: st[N] and an integer variable: pos. The pseudo code for the push() and pop() operations of the stack are as follow:

```
push(x){
    st[pos]=x;
    pos=pos-1;
}
pop() {
    pos=pos+1;
    return(st[pos]);
}
```



ptr=ptr->next

ptr = ptr->prev
~~ptr=ptr->data~~
ptr->next =

Find the initialization of integer variable: pos for an empty stack with a maximum capacity of N elements for the above implementation.

2 + 20

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1,6,3,3,9,8,4 { 5,6,1,3,9,8,1.
1,6,5,3,9,1 56,1,3 9 8 5 1 6 3,9,18 , 5 1 3,6,9,8. 5,1 3 6,9,
5 1 3 6 8 9

2.

a) Write a pseudo code/ C-function to sort the elements present at the even index of an array in ascending order without using any additional data structure. 2

b) Create two dimensional array of M×N dynamically containing English alphabets (capital letters) except 'X'. Write a pseudo code to delete ALL the vowels present in the matrix. Once any vowel found in a row and deleted, the elements will be shifted from the same row as well as the next rows to fill the deleted element. The empty space at last will be replaced by alphabet 'X'. 3

E.g. For deletion of the first vowel (U),

$$\begin{pmatrix} A & S & D & \mathbf{U} & C & J \\ P & R & I & J & K & L \\ M & N & T & W & O & Y \\ Q & S & F & D & B & L \end{pmatrix} \Longrightarrow \begin{pmatrix} A & S & D & C & J & P \\ R & I & J & K & L & M \\ N & T & W & O & Y & Q \\ S & F & D & B & L & \mathbf{X} \end{pmatrix}$$

For deletion of the second vowel (I),

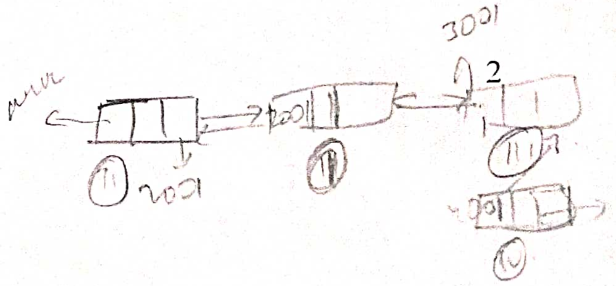
$$\begin{pmatrix} A & S & D & C & J & P \\ R & \mathbf{I} & J & K & L & M \\ N & T & W & O & Y & Q \\ S & F & D & B & L & \mathbf{X} \end{pmatrix} \Longrightarrow \begin{pmatrix} A & S & D & C & J & P \\ R & J & K & L & M & N \\ T & W & O & Y & Q & S \\ F & D & B & L & \mathbf{X} & \mathbf{X} \end{pmatrix} \ldots\ldots\ldots\ldots$$

3.

a)

Node	Data	Prev Address	Next Address	Node Address
I	10	2001	3001	1001
II	15	NULL	NULL	2001
III	-5	NULL	4001	3001
IV	25	NULL	NULL	4001

2



The above table is a representation of doubly linked list where the nodes are declared in C as: struct node { int data; struct node *prev; struct node *next; }; and connected as per the data shown in the table. Draw the linked list. Also, write C-like statements to replace the values of Node-III and Node-IV by adding the value of Node-I to these node values and replace the value of Node-II by subtracting the value Node-I from it. Consider the base pointer ptr, which holds the address of Node-I. Do not use any other pointer variable.

b) The following data are stored in a singly linked list in the order shown below: 3

1->2->3->4->5->6->7->8->9->10

Write a pseudo code/ C-function to delete all odd numbers from the list.

4. Explain sparse matrix and its representations. Write a pseudo code/ C-function to display triplet of transpose a sparse matrix with a suitable example. 5

5. Write an algorithm/ pseudo code/ C-function to convert an expression in infix notation to its equivalent prefix expression. Convert the infix expression: (A+B)+C-(D-E)^F to prefix equivalent mentioning each step of the algorithm. 5

```
while(head != NULL) {
  ~~if(~~ if ((head -> data) % 2 != 0).
    { head = head -> next;
      free(head);
```

*** Best of Luck ***