AUTUMN MID-SEMESTER - 2019
KIIT, Deemed to be University, Bhubaneswar-24
Data Structure and Algorithm
CS-2001

Time: $1^{1/2}$ Hours   Full Mark: 20

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.

(Answer any four questions including question No.1 which is compulsory)

Q1.   Answer all the following questions. Provide appropriate example, if necessary.   [1×5 =5]

(a)   Find the time complexity of the following code -

```
for (i=1;i<=m;i=i×2)
     for (j=1;j<=i;j++)
        printf("%d %d ",i,j);
```

(b)   In a two dimensional matrix A[0,..,r-1, 0..,c-1] the location of A[i, j] is same in both row-major-order and column-major-order. Find the relationship between the number of rows and number of columns (r, c) with the cell index (i, j) and justify the relation with one example.

(c)   Using malloc() write the code section to do the memory allocation for one matrix of size M×N.

(d)   Write algorithm or pseudo code for deleting all the nodes from the single linked list whic. are divisible by a given number k.

(e)   Write a recursive function to display elements of stack using the operation push() and pop() and without violating the LIFO concept.

Q2.   [2.5+2.5]

(a)   Given two sorted arrays A and B. Array A is full and array B is partially full and the number of empty slots are just enough to accommodate all elements of array A. Write one C function to merge the two soted arrays to fill the array B without considering the third array.

(b)   Let the number "XYZ" is represented as Z->Y->X in the linked list. If two such numbers are given in two different linked list then with the above representation write a C-function to subtract the second number (represented in second linked list) from the first number (represented in first linked list) and store the result in third linked list with above

representation.

Note: In a single traversal the code should do the subtraction.

Example: Linked list1:- 1→0→0→2 (List for number 2001)

Linked list2:- 8→7→5 (List for number 578)

Resultant List:- 3→2→4→1 (List for number 1423 i.e 2001-578=1423)

Q3.   [2+3]

(a) Write a C function which will take one unsorted linked list with redundant elements and will output one sorted linked list with unique elements.

(b) What are the different way of representing sparse matrix in memory. Explain through example. Using any suitable representation write the C-function to multiply two sparse matrices.

Q4.   [2.5+2.5]

(a) Write a C-function to reverse the nodes of a double linked list and justify its correctness with suitable example.

(b) Compare the representation of polynomials using array and linked list. Write a C-function to add two polynomials (polynomial with two variables) represented using linked list.

$$\text{e.g.} \ P(x,y) = 7x^5y^3 + 8x^4y^3 - 3y^3 \dots\dots$$

Q5.   [2+3]

(a)

What are the different data structure used to represent the stack ADT. Write the Push() operation using one data structure and Pop() operation using the other data structure on stack ADT.

(b) Convert the infix expression, ((a/(b-c+d))*(e-a)*c) to postfix expression. Write the pseudo code to evaluate the postfix expression and trace the result for the evaluation of resultant postfix expression with the given data as a=6, b=3, c=1, d=2, e=4.