Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Midterm Examination, Fall 2022

Course Code: CSE134, Course Title: Data Structures

Level: 2 Term: 1 Batch: 60

Time: 01:30 Hrs **Marks: 25**

Answer ALL Questions

1. *a)* What is the time complexity of the following code segment? 2 CO1

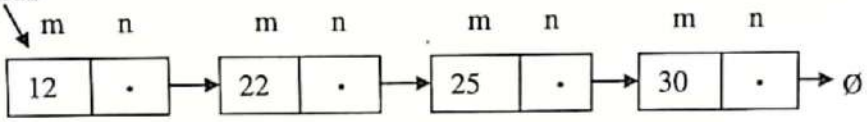
```
int main()
{
int i, j, k, n;
scanf("%d" , &n);
for(i = 1 ;i<= n ; i++)
    {
   for(j = 1 ; j <= n ; j++)
      {
       printf("DIU CSE");
       }
    }
for(k = 1; k <= n ; k++)
    {
     printf("BLC");
     }
}
```

b) Consider the following array and answer the question below: 5
A= {333, 63 , 122, 71, 86, 98, 145, 45, 31}

i. Apply an efficient sorting algorithm to sort the data given in the above array.

c) Consider that your university created a list of merit scholarships for the students of your group and stores the information of scholarship winners by considering the last four digits of the student's IDs in ascending order. Every student can check whether he has been selected for the merit scholarship or not by logging into the system and entering his last four digits in the system. You need to develop a program to perform the task of the students in a fast and efficient way. Also, compute the complexity of your proposed approach. 4

2. Consider the following link list: CO1



a) Construct a function to find a data item in the list and insert a new node after it. 4

b) Construct a function to insert a node at the beginning of the list. 3

3. *a)* Convert the following expression using stack application: CO2

i. Convert 92- (60/3- (2*2^2)/2)*3 to postfix expression and evaluate it. 3

b) Consider an empty stack and a singly link list. Now do the following operations and draw your visualization: push(5), push(6), push(7), push(8), pop(8), push(15), push(45), pop(45), insert(45), pop(15), insert(15), pop(7), insert(7), pop(6), insert(6) pop(5), insert(5), push(2), delete(45) and last of all, draw the final stack and the link list of your visualization. 4

Or

Suppose, you are assigned to implement a structure for a book store. In this store, for each type of books, they are arranged in such a way, that, the books which are stored first, will be sold last but which are at the top, should be sold first. Now, which data structure is suitable to implement the system? Justify your answer.

Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Midterm Examination, Summer 2020 @ DIU Blended Learning Center

Course Code: CSE134 (Day/Evening), Course Title: Data Structure

Level: 1 Term: 3 Section: O-3

Instructor: MD Azharul Islam Tazib Modality: Open Book Exam

Date: Sunday 5 July, 2020 Time: 02:00-06:00pm

Four hours (4:00) to support online open/case study based assessment Marks: 25

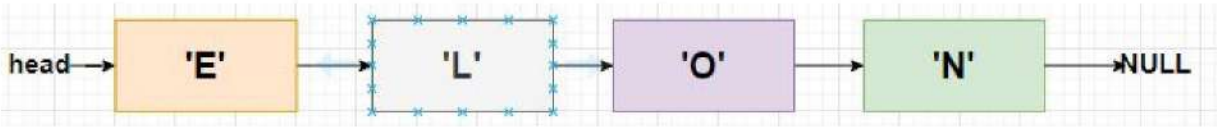
Directions:

- **Students need to go through the CASE STUDY shown in this exam paper.**
- **Analyze and answer specific sections based on your own thinking and work.**
- **Do not share as this will be treated as plagiarism by Blended Learning Center.**

Part A: **03+05**

1. Let's say, you will have to store your name and also in individual characters. For example, if your name is **ELON**, we have to store **'E' , 'L', 'O', 'N'** , these four characters sequentially. What will you use to store your name? A **Character Array** or a **Linked List?** And why so?

2. Write a C code to make a linked list of your name **(First Name)**. And the name of the Data Structure is to be **DATA**. If your name is **ELON**, you have to make this following Linked List:



Part B: **05+05**

So you have already built a linked list with the characters of your name. Solve the following questions keeping the linked list in mind.

1. Write a C function which will count the number of nodes of the linked list which you have built in **Part A.**
2. Write a C function to insert 'X' at the end of the built linked list.

Part C: **02+05**

We all know **Stack**! Right? We have to use Stack to solve the problems of this section.

1. Can we remove a node from a random place of a Stack? Justify your answer.
2. For this program we have to reverse your ID using Stack. So if your ID is **111-22-3333**, you have to print **3333-22-111.**
   Write necessary Code.

THE END

Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Midterm Examination **Semester: FALL 2019**

Course Code: CSE134 **Course Title: Data Structures**

Section: ALL **Course Teacher: ALL**

Time: 1 hr 30 minutes **Full Marks: 25**

Question 1: **03 + 07**

(a) How is Link list different from the array data structure. Why array data structure is sometimes preferred over link list.

(b) Suppose you have to create a data structure to represent a "Student" where student is represented by "studid" whose data type is integer and "studname" whose data type is character array of size 40. You have decided to create a "Student" link list to store student information. Using the data type "Student" created by you, you need to create two students having their information as follows:

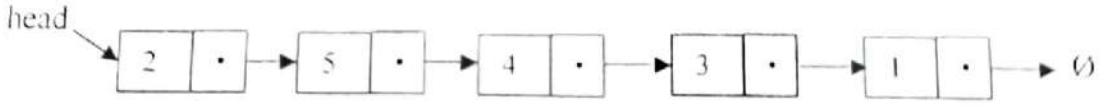
1st – ID = 1001 Name: Karim 2nd – ID = 1002 Name: Rahim

Define the data node "Student" and allocate memory and create and show the link list of two students.

Question 2: **03 + 07**

(a) How is single link list is different from doubly link list. Show using pictorial illustration.

(b) Consider the following representation of link list:



The "Node" contains an integer data member "data" and a pointer member "next". Write code for the following operations and show visual representations.

(1) Write code using C language to delete 3 from the link list.

(2) Write code using C language to insert a node between 5 and 4.

Question 3: **02 + 03**

(a) Convert the following infix expression into prefix and postfix expression:

(1) 8+3*2-9/3+5*2 (2) 3^2+6-2*2+7-6/2

(b) Convert the following expression into postfix expression using stack:

5*3+7-3+9/3+2*3-7

Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Midterm Examination **Semester: SPRING 2019**

Course Code: CSE134 **Course Title: Data Structures**

Section: ALL **Course Teacher: ALL**

Full Marks: 25

Time: 1 hr 30 minutes

Part A: Analytical (write the answer with reason in the answer booklet) 6 X 1 = 6

1. **Array offers better over Linked list data structure for**

a) *Search Time* b) *Space Utilization* c) *Space Utilization and Computational Time*

d) *None of the mentioned*

2. **Linked list data structure saves**

a) *Computational Time* b) *Space Utilization* c) *Space Utilization and Computational Time*

d) *None of the mentioned*

3. **Self-referential structure is**

a) *Simple structure* b) *Structure with a self pointer* c) *Normal variable*

d) *None of the mentioned*

4. **Assuming int is of 8bytes, what is the size of int arr[15]; ?**

a) *15* b) *19* c) *120* d) *60*

5. **Dynamic memory allocation is important for**

a) *Saving memory* b) *Dynamic allocation* c) *Losing memory*

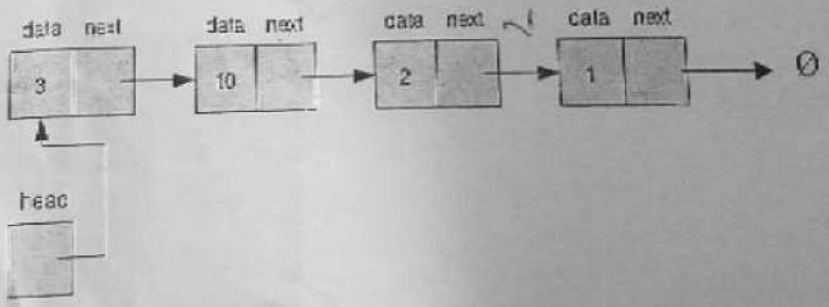
d) *None of the mentioned*

6. **What kind of linked list is best to answer question like "What is the item at position n?"**

a) *Singly linked list* b) *Doubly linked list* c) *Circular linked list* d) *Array implementation of linked list*

Part B: Link List 4+3+3

1. Consider the following link list:



Answer the following questions:

(a) Define the data node and create the link list using C programming language.

(b) Write a C function to insert a node at the end. For example the function "insert" will be called with "10" where "10" will be inserted after the data node "1".

(d) Write a function "count()" which will return number of items in the list.

Part C: Stack and Applications 3+3+3

1. Write the difference between Stack and Array.
2. A stack has the operations: push(14), push(8), pop(), push(9), pop(), push(11), pop(), pop(). Draw the content of stack at each push and pop operations shown above.
3. Show how to convert an infix expression 4*2-6/3+5 to postfix using stack.

---------- Good Luck ----------

Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Midterm Examination **Semester: FALL 2018**

Course Code: CSE134 **Course Title: Data Structures**

Section: ALL **Course Teacher: ALL**

Time: 1 hr 30 minutes **Full Marks: 25**

Part A: Analytical (write the answer with reason in the answer booklet) **5 X 2 = 10**

1. Link list data structure uses dynamic memory to:

a. create array b. create data c. create node d. none of the above

2. Stack data structure is used to:

a. create array b. create stack of items c. create linklist d. None of these

3. Operation is stack is called:

a. FIFO b. PUSH c. POP d. ALL

4. The operator comes after the operand in:

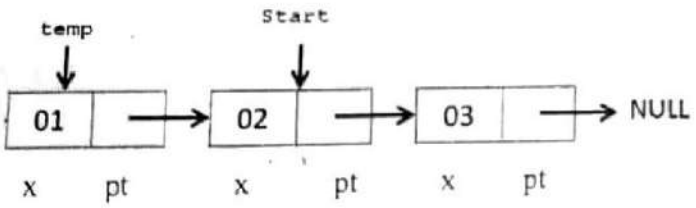
a. Infix b. Prefix c. Postfix d. None

5. A stack is a data structure which is:

a. Linear b. Non Linear c. Hierarchical d. None

Part B: Visualization and Problem Design **4+3**

Consider the following: (write code to create the node and assign data as per the following diagram; the *node variable name is* "ptr")



a. Write code to implement the above and assign the data shown.

b. Create another 4th node at the end and assign with 05 for "x". Connect the "pt" member to the first node.

N.B. declare the node and write only required code but not the whole program

Part C: Queue, Stack and Applications **3+3+2**

1. (a) Consider a Stack using link list is created with the following operations:
push(11); push(7); push(5), pop(); push(12); push(9); pop(); pop(); pop()
draw the state of the stack during each operation and the final content of the stack.

(b) Write the application stack in the real life?

(c) Convert the infix expression 8-3*2-8/2+5-2*3 into postfix using stack.

---------- Good Luck ----------

Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Midterm Examination **Semester: Spring 2018**

Course Code: CSE134 **Course Title: Data Structures**

Section: ALL **Course Teacher: ALL**

Time: 1 hr 30 minutes **Full Marks: 25**

Part A: Analytical (write the answer with reason in the answer booklet) **3 X 2 = 6**

1. Entries in a stack are "ordered". What is the meaning of this statement?

a) A collection of stacks is sortable. b) Stack entries may be compared with the '<' operation.

c) The entries are stored in a linked list. d) There is a Sequential entry that is one by one.

2. Assuming int is of 4bytes, what is the size of int arr[12]; ?

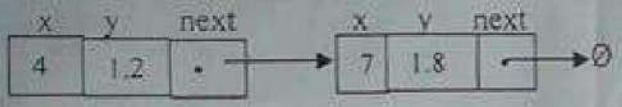
a) 15 b) 19 c) 48 d) 60

3. What kind of linked list is best to answer question like "What is the item at position n?"

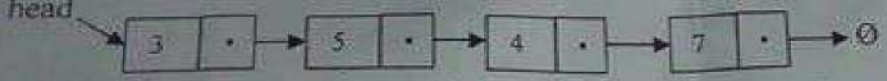
a) Singly linked list b) Doubly linked list c) Circular linked list d) Array implementation of linked list

Part B: Link List **4+3+1+3**

1. Write code for the following: (write code to create the node and assign as per the following diagram; the node variable name is "head")



2. Consider the following link list:



The "Node" contains an integer data member "data" and a pointer member "next". Write code for the following operations.

a. A function to *insert* a node at the end of the list.

b. A function to *delete* a node. The function receive the data to delete as the parameter when called.

c. A function to *search* a data in the list. If found the function display message "Found" or "Not Found"

N.B. declare the node and write only required code but not the whole program

Part C: Queue, Stack and Applications **2+2+2+2**

(a) Consider a Stack using link list is created with the following operations:
push(7); push(9); pop(); push(3); push(8); pop(); pop();
draw the state of the stack during each operation and the final content of the stack.

(b) In the linked list implementation of the stack, where does the push member function place the new entry on the linked list and why?

(c) Convert the infix expression 8-3*2+9/3+5-4*2 into postfix using stack.

(d) Given a 5 element stack S (from top to bottom: 3, 2, 5, 9, 7), and an empty queue Q, remove the elements one-by-one from S and insert them into Q, then remove them one-by-one from Q and re-insert them into S. Draw the final stack S.

---------- Good Luck ----------

Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Midterm Examination **Semester: Fall 2017**

Course Code: CSE134 **Course Title: Data Structures**

Section: ALL **Course Teacher: ALL**

Time: 1 hr 30 minutes **Full Marks: 25**

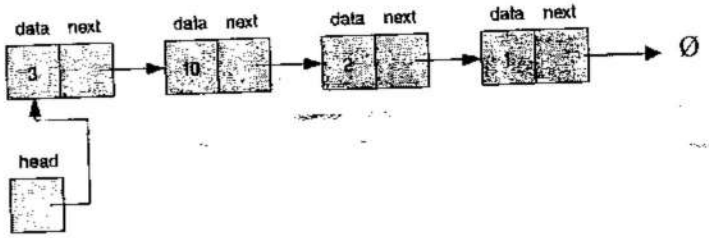
Part A: Analytical (write the answer with reason in the answer booklet) **3 X 2 = 6**

1. Linked list data structure offers considerable saving in
a) Computational Time b) Space Utilization c) Space Utilization and Computational Time
d) None of the mentioned
2. Assuming int is of 4bytes, what is the size of int arr[15]; ?
a) 15 b) 19 c) 11 d) 60
3. What kind of linked list is best to answer question like "What is the item at position n?"
a) Singly linked list b) Doubly linked list c) Circular linked list d) Array implementation of linked list

4+3+1+3

Part B: Link List

1. Consider the following link list:



Answer the following questions:
(a) Define the data node and create the link list using C program code.
(b) Write a C function to insert a node between any two node. For example the function "insertBetween" will be called with "10" and "15" where "15" will be inserted after the data node "10".
(c) What will be time complexity if you need to insert a node at the end.
(d) Write a function "count()" which will return number of items in the list.

2+2+2+2

Part C: Queue, Stack and Applications

2. (a) Consider a Stack using link list is created with the following operations:
push(5); push(3); pop(); push(7); push(11); pop(); pop();
draw the state of the stack during each operation and the final content of the stack.
(b) In the linked list implementation of the stack, where does the push member function place the new entry on the linked list and why?
(c) Convert the infix expression 5+3*2-8/4+6-4*2 into postfix using stack.
(d) Given a 5 element stack S (from top to bottom: 2, 4, 6, 8, 10), and an empty queue Q, remove the elements one-by-one from S and insert them into Q, then remove them one-by-one from Q and re-insert them into S. Draw the final stack S.

---------- Good Luck ----------

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Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Midterm Examination, Semester: SPRING 2017

Course Code: CSE134 Course Title: Data Structures

Section: ALL Course Teacher: ALL

Time: 1 hr 30 minutes **Full Marks: 25**

Part A: Visualization of code 4+2

Consider the following code and draw the representation from the code:

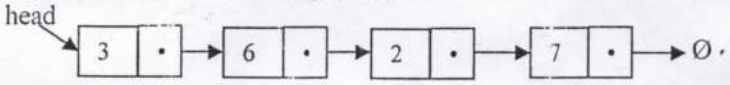
```
struct Node{
  int x, y;
  float z;
  struct Node *p;
 struct Node *q;
};
typedef struct Node node;
node *head;
head = (node *) malloc(sizeof( node));
head->z= 2.2; head->x= head->y=5;head->p=NULL;
head->q = (node*) malloc(sizeof(node));
head->q->x=head->q->y= head->q->z =0; head->q->p=NULL;head->q->q=NULL;
```

1. **Draw the picture representation of the above code.**
2. **Why the above structure is called self-referential structure.**

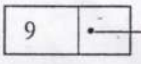
Part B: Working with Link List 6+3*3

(a) Consider you have to create a Node which contains an integer and a float data member and a pointer member of its same type. Using this node you need to create a link list of three nodes connected to each other. The data you need to store are: {3, 2.7} {5, 3.7} {7, 2.9}. Write code using C language to create the node and assign the data along with the link.

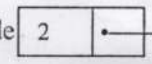
(b) Consider the following link list:



The "Node" contains an integer data member "data" and a pointer member "next". Write code for the following operations.

(1) A function to *insert* a node 

at the end of the list.

(2) A function to *delete* the node 

The function receive the data to be deleted as the parameter when called.

(3) A function to *count* number of data in the list. The function returns the number of items.

N.B. declare node and write the required code only

Part B: Stack and Applications 4

(a) Convert the following expressions: 2*2 = 4

(1) / + - * 6 2 8 2 / 6 3 to Infix and then convert it into postfix using Stack.

(2) 5-8/4+2*5+7-3*2 to Prefix and Postfix

---------- Good Luck ----------

Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Midterm Examination, Semester: FALL 2016

Course Code: CSE134 Course Title: Data Structures

Section: ALL Course Teacher: ALL

Time: 1 hr 30 minutes **Full Marks: 25**

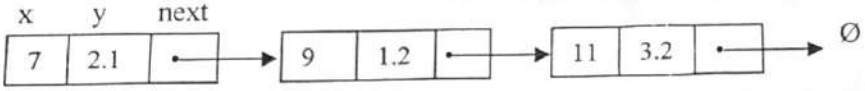
Part A: Visualize Link Node 5

Consider the following code and draw the representation from the code:

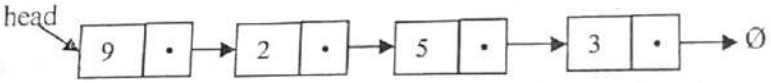
```
struct Node{
  float a;
  int b;
  struct Node *next;
  struct Node *prev;
};
typedef struct Node node;
node *head;
head = (node *) malloc(sizeof( node));
head->a=3.2; head->b=7;head->prev=NULL;
 head->next = (node*) malloc(sizeof(node));
head->next->a=head->next->b=0; head->next->next=NULL;head->prev->prev=NULL;
```

Part B: Working with Link List 7+3*3

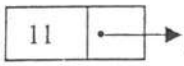
(a) Write code for the following: (write code to create the nodes and assign as per the following diagram; the node variable name is "head")

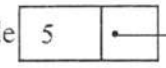


(b) Consider the following link list:



The "Node" contains an integer data member "data" and a pointer member "next". Write code for the following operations.

(1) A function to *insert* a node  at the end of the list.

(2) A function to *delete* the node  The function receive the data to be deleted as the parameter when called.

(3) A function to *count* number of data in the list. The function returns the number of items.

N.B. declare node and write the required code only without main and includes

Part B: Stack and Applications 4

(a) Convert the following expressions: 2*2 = 4

(1) * + - * 8 2 9 3 / 4 2 to Infix and then convert it into postfix using Stack.

(2) 9-3*2+6/3+8-4*2 to Prefix and Postfix

---------- Good Luck ----------

Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Midterm Examination, Semester: SUMMER 2016

Course Code: CSE134 **Course Title: Data Structures**

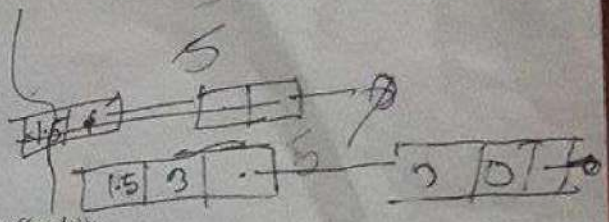
Section: ALL **Course Teacher: ALL**

Time: 1 hr 30 minutes **Full Marks: 25**

Part A: Visualize Link Node

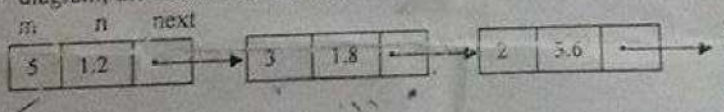
Consider the following code and draw the representation:

```
struct Node{
  float a;
  int b;
  struct Node *next;
};
typedef struct Node node;
node *head;
head = (node *) malloc(sizeof(node));
head->a=1.5; head->b=3; head->next = (node*) malloc(sizeof(node));
head->a=head->b=0; head->next=NULL;
```



Part B: Working with Link List

(a) Write code for the following: (write code to create the node and assign as per the following diagram; the node variable name is "head")



(b) Consider the following link list:

The "Node" contains an integer data member "data" and a pointer member "next". Write code for the following operations.

(1) A function to *insert* a node at the end of the list.

(2) A function to *delete* a node. The function receive the data to be deleted as the parameter when called.

(3) A function to *count* number of data in the list. The function returns the number of items.

N.B. declare node and write the required code but not the whole program

Part B: Stack and Applications

(a) Convert the following expressions:

(i) [illegible] to Infix and Prefix using Stack.

(ii) 9-3*2+6/3+8-4*2 to Prefix and Postfix

---------- Good Luck ----------