Data Structures Lab (CSC204) **Session: Monsoon 2021-22**
III BTech (CSE) **Date: 07.09.2021**

Assignment-4 (Linked List)

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1. A process scheduler assigns each process to the processor one by one for a fixed amount of time. It utilizes a circular linked list to find the next process in the queue. The processes are inserted into the linked list based on some criteria, so that the processes with high priorities will be assigned before the remaining ones. During the execution, some of the processes complete their assigned work. So, these processes are deleted from the linked list. In this problem, you are required to perform the following tasks for managing the processes in the linked list:

   (a) Write a function ***Create_cirlist*** to create a circular linked list using the given input in the form of process numbers. This function takes the *head* of the linked list as an argument. Note that the pointer *head* points to the first node of the linked list.

   Sample Input:
   $Enter\ the\ process\ numbers = 9\ 5\ 7\ 8\ 4\ 2\ 3$
   Sample Output:
   $The\ circular\ linked\ list\ is: 9 \longrightarrow 5 \longrightarrow 7 \longrightarrow 8 \longrightarrow 4 \longrightarrow 2 \longrightarrow 3$

   (b) Write a function ***Del_begn*** to delete a node from the beginning of the list. This function takes the *head* of the linked list as an argument.

   Sample Input:
   $Deletion\ from\ the\ begining\ of\ the\ list$
   Sample Output:
   $The\ linked\ list\ is: 5 \longrightarrow 7 \longrightarrow 8 \longrightarrow 4 \longrightarrow 2 \longrightarrow 3$

   (c) Write a function ***Del_last*** to delete a node from the ending of the list. This function takes the *head* of the linked list as an argument.

   Sample Input:
   $Deletion\ from\ the\ ending\ of\ the\ list$
   Sample Output:
   $The\ linked\ list\ is: 5 \longrightarrow 7 \longrightarrow 8 \longrightarrow 4 \longrightarrow 2$

   (d) Write a function ***Del_loc*** to delete a node from the given location of the list. This function takes the location of the node to be deleted and the *head* of the linked list as arguments. Assume that the location of first node is 1.

   Sample Input:
   $Enter\ the\ location\ of\ the\ node\ to\ be\ deleted = 3$
   Sample Output:
   $The\ modified\ linked\ list\ is: 5 \longrightarrow 7 \longrightarrow 4 \longrightarrow 2$

2. A web application provides access to different web pages. The web pages are usually linked with each other in order to provide a great browsing experience to the user. The application utilizes a doubly linked list to link web pages in bidirectional way. You are required to assist in the development of the application by performing the following tasks:

   (a) Write a function ***Create_list*** to create a doubly linked list using the given input in the form of distinct web page numbers. This function takes the *head* of the linked list as an argument. Note that the pointer *head* points to the first node of the linked list.

   Sample Input:
   $Enter\ the\ page\ numbers =\ 7\ 6\ 5\ 9\ 8\ 1$
   Sample Output:
   $The\ linked\ list\ is: 7 \leftrightarrow\ 6 \leftrightarrow\ 5 \leftrightarrow\ 9 \leftrightarrow\ 8 \leftrightarrow\ 1$

   (b) Write a function ***Insert_begn*** to insert a node at the beginning of the list. This function takes the *head* of the linked list as an argument.

   Sample Input:
   $Insert\ the\ value\ of\ the\ node =\ 2$
   Sample Output:
   $The\ linked\ list\ is: 2 \leftrightarrow\ 7 \leftrightarrow\ 6 \leftrightarrow\ 5 \leftrightarrow\ 9 \leftrightarrow\ 8 \leftrightarrow\ 1$

   (c) Write a function ***Insert_last*** to insert a node at the last position of the list. This function takes the *head* of the linked list as an argument.

   Sample Input:
   $Insert\ the\ value\ of\ the\ node =\ 3$
   Sample Output:
   $The\ linked\ list\ is: 2 \leftrightarrow\ 7 \leftrightarrow\ 6 \leftrightarrow\ 5 \leftrightarrow\ 9 \leftrightarrow\ 8 \leftrightarrow\ 1 \leftrightarrow 3$

   (d) Write a function ***Insert_loc*** to insert a node after the node with a specific web page number. This function takes the *head* of the linked list, web page number of the inserted node, and the web page number of the node after which the new node need to be inserted as arguments.

   Sample Input:
   $Enter\ the\ web\ page\ number\ of\ the\ node\ after\ which\ insertion\ will\ be\ performed = 7$
   $Enter\ the\ web\ page\ number\ of\ the\ inserted\ node =\ 4$
   Sample Output:
   $The\ linked\ list\ is: 2 \leftrightarrow\ 7 \leftrightarrow\ 4 \leftrightarrow\ 6 \leftrightarrow\ 5 \leftrightarrow\ 9 \leftrightarrow\ 8 \leftrightarrow\ 1 \leftrightarrow 3$