```
//Doubly Circular Linked List

# include <stdio.h>
# include <conio.h>

struct emp
{
      int code;
      char name[10];
      struct emp *next, *prev;
};

typedef struct emp empl;

empl *start;

void main()
{
      int choice;
      void insert_first();
      void insert_last();
      void insert_specific();
      void delete_first();
      void delete_last();
      void delete_specific_value();
      void delete_specific_nodeno();
      void display();
      void search();
      void sort();

      do
      {
            clrscr();

            printf("\n\t1. Insert First");
            printf("\n\t2. Insert Last");
            printf("\n\t3. Insert Specific");
            printf("\n\t4. Delete First");
            printf("\n\t5. Delete Last");
            printf("\n\t6. Delete Specific by Value");
            printf("\n\t7. Delete Specific by Node No");
            printf("\n\t8. Display");
            printf("\n\t9. Search");
            printf("\n\t10. Sort");
            printf("\n\t0. Exit");

            printf("\n\tEnter your choice : ");
            scanf("%d",&choice);

            switch(choice)
            {
                  case 1:
                        insert_first();
                        break;
                  case 2:
                        insert_last();
                        break;
                  case 3:
                        insert_specific();
                        break;
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                case 4:
                      delete_first();
                      break;
                case 5:
                      delete_last();
                      break;
                case 6:
                      delete_specific_value();
                      break;
                case 7:
                      delete_specific_nodeno();
                      break;
                case 8:
                      display();
                      break;
                case 9:
                      search();
                      break;
                case 10:
                      sort();
                      break;
                case 0:
                      printf("\n\tEnd of the program");
                      break;
                default:
                      printf("\n\tInvalid Choice");
                      break;
          }
          getch();
      }
      while(choice != 0);
}

void insert_first()
{
      struct emp *newnode,*temp;
      if(start == NULL)
      {
          start = (struct emp *) malloc(sizeof(struct emp));
          start->next = start;
          start->prev = start;
          newnode = start;
      }
      else
      {
          newnode = (struct emp *) malloc(sizeof(struct emp));
          newnode->next = start;
          newnode->prev = start->prev;
          start->prev = newnode;

          temp = start;
          while(temp->next != start)
          {
                temp = temp->next;
          }

          temp->next = newnode;

          start = newnode;
      }
```

```
	printf("\n\tEnter Emp. Code = ");
	scanf("%d",&newnode->code);

	printf("\n\tEnter Emp. Name = ");
	fflush(stdin);
	gets(newnode->name);
}

void insert_last()
{
	struct emp *newnode, *temp;

	if(start == NULL)
	{
		start = (struct emp *) malloc(sizeof(struct emp));
		start->next = start;
		start->prev = start;
		newnode = start;
	}
	else
	{
		temp = start;
		while(temp->next != start)
		{
			temp = temp->next;
		}
		newnode = (struct emp *) malloc(sizeof(struct emp));
		newnode->next = temp->next;
		newnode->prev = temp;
		temp->next = newnode;
		start->prev = newnode;
	}

	printf("\n\tEnter Emp. Code = ");
	scanf("%d",&newnode->code);

	printf("\n\tEnter Emp. Name = ");
	fflush(stdin);
	gets(newnode->name);
}

void insert_specific()
{
	struct emp *newnode, *temp;
	int a, nodeno, count=1;

	if(start == NULL)
	{
		insert_first();
	}
	else
	{
		temp = start;
		while(temp->next != start)
		{
			temp = temp->next;
			count++;
		}
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```
            do
            {
                  printf("\n\tEnter node no between 1 to %d = ", count+1);
                  scanf("%d",&nodeno);
            }
            while(nodeno < 1 || nodeno > count+1);

            if(nodeno == 1)
                  insert_first();
            else if(nodeno == count+1)
                  insert_last();
            else
            {
                  temp = start;
                  a=1;
                  while(a < nodeno-1)
                  {
                        a++;
                        temp = temp->next;
                  }

                  newnode = (struct emp *) malloc(sizeof(struct emp));
                  newnode->next = temp->next;
                  newnode->prev = temp;

                  temp->next->prev = newnode;
                  temp->next = newnode;

                  printf("\n\tEnter Emp. Code = ");
                  scanf("%d",&newnode->code);

                  printf("\n\tEnter Emp. Name = ");
                  fflush(stdin);
                  gets(newnode->name);
            }
      }
}

void delete_first()
{
      struct emp *deletenode, *temp;

      if(start == NULL)
      {
            printf("\n\tDoubly Circular Linked List is Empty");
      }
      else
      {
            deletenode = start;
            temp = start;

            while(temp->next != start)
            {
                  temp = temp->next;
            }
            temp->next = start->next;

            if(start->next != start)
            {
                  start->next->prev = start->prev;
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```
                start = start->next;
            }
            else
            {
                start = NULL;
            }
            printf("\n\tDelete Node Information : ");
            printf("\n\tEmp. Code = %d",deletenode->code);
            printf("\n\tEmp. Name = %s",deletenode->name);

            free(deletenode);
      }
}

void delete_last()
{
      struct emp *deletenode, *temp;

      if(start == NULL)
      {
            printf("\n\tDoubly Circular Linked List is Empty");
      }
      else
      {
            if(start->next == start)
            {
                deletenode = start;
                start = NULL;
            }
            else
            {
                temp = start;
                while(temp->next->next != start)
                {
                      temp = temp->next;
                }
                deletenode = temp->next;
                temp->next = temp->next->next;
                start->prev = temp;
            }

            printf("\n\tDelete Node Information = ");
            printf("\n\tEmp. Code = %d",deletenode->code);
            printf("\n\tEmp. Name = %s",deletenode->name);
            free(deletenode);
      }
}

void delete_specific_value()
{
      struct emp *deletenode=NULL, *temp;
      int ecode;

      if(start == NULL)
      {
            printf("\n\tDoubly Circular Linked List is Empty");
      }
      else
      {
            printf("\n\tEnter Emp. Code to Delete : ");
```

```
            scanf("%d",&ecode);

            if(start->code == ecode)
            {
                  delete_first();
            }
            else
            {
                  temp = start;

                  while(temp->next != start)
                  {
                        if(temp->next->code == ecode)
                        {
                              deletenode = temp->next;
                              deletenode->next->prev = temp;
                              temp->next = temp->next->next;
                              break;
                        }
                        temp = temp->next;
                  }

                  if(deletenode == NULL)
                  {
                        printf("\n\tEmp. Code %d not found", ecode);
                  }
                  else
                  {
                        printf("\n\tDelete Node Information =");
                        printf("\n\tEmp. Code = %d",deletenode->code);
                        printf("\n\tEmp. Name = %s",deletenode->name);
                        free(deletenode);
                  }
            }
      }
}

void delete_specific_nodeno()
{
      struct emp *deletenode, *temp;
      int a, count = 1, nodeno;

      if(start == NULL)
      {
            printf("\n\tDoubly Circular Linked List is Empty");
      }
      else
      {
            temp = start;
            while(temp->next != start)
            {
                  temp = temp->next;
                  count++;
            }

            do
            {
                  printf("\n\tEnter Node no. to delete between 1 to %d =
", count);
                  scanf("%d",&nodeno);
```

```
            }
            while(nodeno < 1 || nodeno > count);

            if(nodeno == 1)
            {
                  delete_first();
            }
            else if(nodeno == count)
            {
                  delete_last();
            }
            else
            {
                  temp = start;
                  a=1;

                  while(a < nodeno-1)
                  {
                        temp = temp->next;
                        a++;
                  }

                  deletenode = temp->next;

                  deletenode->next->prev = deletenode->prev;
                  temp->next = temp->next->next;

                  printf("\n\tDelete Node Information = ");
                  printf("\n\tEmp. Code = %d",deletenode->code);
                  printf("\n\tEmp. Name = %s",deletenode->name);

                  free(deletenode);
            }
      }
}


void display()
{
      empl *temp;
      if(start == NULL)
      {
            printf("\n\tDoubly Circular Linked List is Empty");
      }
      else
      {
            temp = start;

            printf("\n\tForward Direction");
            printf("\n\tEmp. Code\t\tEmp. Name");
            while(temp->next != start)
            {
                  printf("\n\t%d\t\t\t%s",temp->code, temp->name);
                  temp = temp->next;
            }
            printf("\n\t%d\t\t\t%s",temp->code, temp->name);

            printf("\n\n\tBackward Direction");
            printf("\n\tEmp. Code\t\tEmp. Name");
            while(temp->prev != start->prev)
```

```
            {
                  printf("\n\t%d\t\t\t%s",temp->code, temp->name);
                  temp = temp->prev;
            }
            printf("\n\t%d\t\t\t%s",temp->code, temp->name);
      }
}

void search()
{
      int empcode, flag = 0;
      struct emp *temp;

      if(start == NULL)
      {
            printf("\n\tDoubly Circular Linked List is Empty");
      }
      else
      {
            printf("\n\tEnter Emp. Code to Search : ");
            scanf("%d",&empcode);

            if(start->code == empcode)
            {
                  //flag = 1;
                  temp = start;
            }
            else
            {
                  temp = start;

                  while(temp->next != start)
                  {
                        if(temp->next->code == empcode)
                        {
                              temp = temp->next;
                              flag = 1;
                              break;
                        }
                        temp = temp->next;
                  }
            }
            if(flag == 0)
            {
                  printf("\n\tEmp. Code %d not found", empcode);
            }
            else
            {
                  printf("\n\tEmp. Code Found");
                  printf("\n\tEmp. Code = %d",temp->code);
                  printf("\n\tEmp. Name = %s",temp->name);
            }
      }
}

void sort()
{
      empl *temp1, *temp2;
      int ecode;
      char ename[10];
```

```
	if(start == NULL)
	{
		printf("\n\tDoubly Circular Linked List is Empty");
	}
	else
	{
		temp1 = start;
		while(temp1->next != start)
		{
			temp2 = temp1->next;
			while(temp2 != start)
			{
				if(temp1->code > temp2->code)
				{
					ecode = temp1->code;
					temp1->code = temp2->code;
					temp2->code = ecode;

					strcpy(ename, temp1->name);
					strcpy(temp1->name, temp2->name);
					strcpy(temp2->name, ename);
				}
				temp2 = temp2->next;
			}
			temp1 = temp1->next;
		}
		display();
	}
}
```