GDC MEMORIAL COLLEGE

BAHAL (BHIWANI)-127028

Lab Manual

DATA STRUCTURE (B.Sc.(cs) 2nd year)

Department of Computer Science

B. Sc. (Computer Science) Semester-IV

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/*Program 1: Calculate and print reverse of an array*/

```
#include < stdio.h >
#include < conio.h >
void main()
{
        int a[10],i,n;
        clrscr();
        printf("Enter the size of array\n");
        scanf("%d",&n);
        printf("Enter the %d elements\n",n);
        for(i=0;i < n;i++)
        {
                scanf("%d",&a[i]);
```

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```
        }
        printf("The %d elements are \n",n);
        for(i=0;i < n;i++)
        {
                printf("%5d",a[i]);
        }
        printf("\n");
        printf("The %d elements in reverse order are\n",n);
        for(i=n-1;i>=0;i--)
        {
                printf("%5d",a[i]);
        }
        getch();
}
```

/*Program 2:Find the transpose of a matrix*/

```
#include < stdio.h >
#include < conio.h >
void main()
{
        int m1[10][10],m2[10][10];
        int r,c,i,j;
        clrscr();
        printf("\nEnter r & c : ");
        scanf("%d %d",&r,&c);
        printf("\nEnter first matrix of size %d X %d\n",r,c);
        for(i=0;i< r ; i ++)
        {
```

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```
        for(j=0;j < c;j++)
        {
                scanf("%d",&m1[i][j]);
        }
}
for(i=0;i < r ; i ++)
{
        for(j=0;j < c;j++)
        {
                m2[j][i] = m1[i][j];
        }
}
printf("\nthe original matrix is\n");
for(i=0;i < r;i++)
{
        for(j=0;j < c;j++)
        {
                printf("%4d",m1[i][j]);
                printf("\n");
        }
} // for
printf("\nThe resultane matrix is\n");
for(i=0;i< c;i++)
{
        for(j=0;j < r;j++)
        {
                printf("%4d",m2[i][j]);
```

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```
                }
                printf("\n");
        } // for
} // main
```

/*Program 3: Find the length of given linked list*/

```
#include < stdio.h >
#include < conio.h >
#include < alloc.h >
#define newnode (struct node*) malloc(sizeof(struct node))
struct node
{
        int data;
        struct node *next;
};
struct node *create_list();
void main()
{
        struct node *f;
        int len;
        f = NULL;
        clrscr();

        f = create_list();
        len = find_len(f);
        printf("\n length = %d",len);
} // main
```

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```
struct node *create_list()
{
        struct node *f,*c,*p;
        int tdata;
        f = NULL;
        printf("\n Enter data ( use 0 to exit ) : ");
        scanf("%d",&tdata);
        while( tdata != 0 )
        {
                c = newnode;
                if( c == NULL)
                {
                        printf("\n Insuf. mem. ");
                        exit(0);
                }
                c->data = tdata;
                c->next = NULL;
                if( f== NULL)
                        f = c;
                else
                        p->next = c;
                        p = c;
                        printf("\n Enter data ( use 0 to exit ) : ");
                        scanf("%d",&tdata);
        } //while
        return(f);
} // create list
```

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```
int find_len(struct node *f)
{
        int len=0;
        struct node *t;
        if( f == NULL)
        return(0);
        t = f;
        while( t != NULL )
        {
                len++;
                t = t->next;
        }
        return(len);
}
```

/*Program 4: Insert and delete operations over queue*/

```
#include < stdio.h >
#include < conio.h >
#define max 3
void main()
{
        int queue[max],data;
        int front,rear,reply,option;
        clrscr();
        //... init queue
        front = rear = -1;
        do
```

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```
{
        printf("\n 1. insert queue");
        printf("\n 2. delete queue");
        printf("\n 3. exit");
        printf("\nSelect proper option :");
        scanf("%d",&option);
        switch(option)
        {
                case 1 ://insert
                printf("\nEnter data : ");
                scanf("%d",&data);
                reply = insertq(queue,&rear,&data);
                if ( reply == - 1)
                        printf("Queue is full");
                else
                        printf("Inserted data in queue");
                break;
                case 2 : //dele
                reply = delq(queue,&front,&rear,&data);
                if ( reply == -1 )
                        printf("Queue is empty ");
                else
                        printf("Deleted data is : %d", data);
                        break;
                case 3 : exit(0);
        } //switch
} while(1);
```

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```
} // main
int insertq ( int queue[max], int *rear , int *data)
{
        if ( *rear == max -1 )
                return(-1);
        else
        {
                *rear = *rear + 1;
                queue[*rear] = *data;
                return(1);
        } // else
} // insert
int delq( int queue[max], int *front, int *rear , int *data)
{
        if ( *front == *rear)
                return(-1);
        else
        {
                (*front)++;
                *data = queue[*front];
                return(1);
        } // else
} // insert
```

/*Program 5: Sort n names in the descending order*/

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

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```
void main()
{
        char *list[100],temp[10];
        int n,i,j;
        clrscr();
        printf("How many names?\n");
        scanf("%d",&n);
        printf("Enter %d names \n",n);
        for(i=0;i < n;i++)
        {
                list[i]=(char *)malloc(100);
                flushall();
                gets(list[i]);
        }
        for(i=0;i < n-1;i++)
        {
                for(j=i+1;j < n;j++)
                {
                        strcmp(list[i],list[j]);
                        {
                                strcpy(temp,list[i]);
                                strcpy(list[i],list[j]);
                                strcpy(list[j],temp);
                        }
                }
        }
        printf("The %d names in sorted order are\n",n);
```

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```
        for(i=0;i < n;i++)
        {
                puts(list[i]);
        }
}//main
```

/*Program 6: Create encrypted string using the given input string*/

```
#include < stdio.h >
#include < conio.h >
void main()
{
        char str[100];
        int diff,new_code,key;
        int i;
        clrscr();
        printf("\nEnter a string \n");
        gets(str);
        printf("\nEnter a key : ");
        scanf("%d",&key);
        key = key % 27;
        for(i=0; str[i] != '\0' ; i++)
        {
                if ( str[i] >= 'a' && str[i] <= 'z' )
                {
                        new_code = str[i] + key;
                        if( new_code > 'z' )
                        {
                                diff = new_code - 'z' - 1;
```

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```
            str[i] = 'a' + diff;
    }
    else
    if ( new_code < 'a' )
    {
            diff = 'a' - new_code - 1;
            str[i] = 'z' - diff;
    }
    else
            str[i] = new_code;
    }
    else
    if ( str[i] >= 'A' && str[i] <= 'Z' )
    {
            new_code = str[i] + key;
    if( new_code > 'Z' )
    {
            diff = new_code - 'Z' - 1;
            str[i] = 'A' + diff;
    }
    else
    if ( new_code < 'A' )
    {
            diff = 'A' - new_code - 1;
            str[i] = 'Z' - diff;
    }
    else
```

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```
                    str[i] = new_code;
                }
        } // for
        printf("\nThe encrypted string is \n");
        puts(str);
} // main
```

/*Program 7: Structure using array*/

```
#include < stdio.h >
#include < conio.h >
struct emp
{
        int empno;
        char name[10];
        int sal;
}e1[5];
void main()
{
        int i;
        clrscr();
        for(i=0;i < 5;i++)
        {
                printf("Enter the empno\n");
                scanf("%d",&e1[i].empno);
                printf("Enter the name\n");
                flushall();
                gets(e1[i].name);
                printf("Enter the salary\n");
```

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```
            scanf("%d",&e1[i].sal);
        }
        printf("The record is\n");
        for(i=0;i < 5;i++)
        {
            printf("\n %4d",e1[i].empno);
            printf("%8s",e1[i].name);
            printf(" %4d\n",e1[i].sal);
        }
        getch();
}
```

/*Program 8: Perform push and pop operations over stack in C*/

```
#include < stdio.h >
#include < conio.h >
#define max 5
void main()
{
        //... create stack
        int stack[max],data;
        int top,option,reply;
        //... init stack
        top = -1;
        clrscr();
        do
        {
            printf("\n 1. push");
            printf("\n 2. pop");
```

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```
            printf("\n 3. exit");
            printf("\nSelect proper option : ");
            scanf("%d",&option);
            switch(option)
            {
                case 1 : // push
                        printf("\n Enter a value : ");
                        scanf("%d",&data);
                        reply = push(stack,&top,&data);
                        if( reply == -1 )
                                printf("\nStack is full");
                        else
                                printf("\n Pushed value");
                        break;
                case 2 : // pop
                        reply = pop ( stack,&top,&data);
                        if( reply == - 1)
                                printf("\nStack is empty");
                        else
                                printf("\n Popped value is %d",data);
                        break;
                case 3 : exit(0);
            } // switch
        }while(1);
} // main
int push( int stack[max],int *top, int *data)
{
```

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```
        if( *top == max -1 )
                return(-1);
        else
        {
                *top = *top + 1;
                stack[*top] = *data;
                return(1);
        } // else
} // push
int pop( int stack[max], int *top, int *data)
{
        if( *top == -1 )
                return(-1);
        else
        {
                *data = stack[*top];
                *top = *top - 1;
                return(1);
        } //else
} // pop
```

/*Program 9: Sort numeric array using bubble sort*/

```
#include < stdio.h >
#include < conio.h >
void main()
{
   int a[20],t;
    int i,j,n;
```

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```
    clrscr();
    printf("\nEnter n :");
    scanf("%d",&n);
    printf("\nEnter %d values \n",n);
    for(i=0;i < n;i++)
    {
       scanf("%d",&a[i]);
    }
    printf("\n%d values before sorting are \n",n);
    for(i=0;i < n;i++)
    {
       printf("%4d",a[i]);
    }
    bubble_sort(a,n);
    printf("\n%d values after sorting are \n",n);
    for(i=0;i < n;i++)
    {
       printf("%4d",a[i]);
    }
}
int bubble_sort(int a[],int n)
{
    int i,j,k;
    int t;
    for(k=n;k>=1;k--)
    {
       for(i=0,j=1;j < =k;i++,j++)
```

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```
        {
            if (a[j] < a[i])
            {
               t=a[i];
               a[i]=a[j];
               a[j]=t;
            }
        }
    }
    return;
}
```

/*Program 10: Sort n values using quick sort method*/

```
#include < stdio.h >
#include < conio.h >
void main()
{
        int a[50];
        int n;
        clrscr();
        printf("\nEnter n: ");
        scanf("%d",&n);
        read_data(a,n);
        a[n]=9999;
        printf("\nBefore sort :");
        print_data(a,n);
        qsort(a,0,n-1,n);
    printf("\nAfter sort :");
```

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```
    print_data(a,n);
}
int read_data(int a[],int max)
{
        int i;
        printf("\nEnter %d values \n",max);
        for(i=0; i < max; i++)
        {
                scanf("%d",&a[i]);
        }
        return;
}
int print_data(int a[],int max)
{
        int i;
        for(i=0; i < max; i++)
        {
                printf("%4d",a[i]);
        }
        return;
}
int quick_sort(int a[],int l,int h,int n)
{
        int i,j,k,t;
        if(l < h)
        {
                k=a[l];
```

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```
        i=l;
        j=h+1;
        while( i < j)
        {
                while( i < h && a[i] <= k)
                        i++;
                while( j > l && a[j] > =k)
                        j--;
                if( i < j)
                {
                    t=a[i];
                    a[i]=a[j];
                    a[j]=t;
                }
        }
        if( l != j)
        {
                t=a[l];
                a[l]=a[j];
                a[j]=t;
        }
        printf("\nOutput :");
        print_data(a,n);
        qsort(a,l,j-1,n);
        qsort(a,j+1,h,n);
}
//print_data(a,n);
```

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```
        return;
}
```