DS LAB SEM3

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SRN : PES2UG20CS130

Section : C

Week 1

Task 1: Recursive function to search for a substring within a given string. Return True if substring is found, else return false

Code:

```c
#include<stdio.h>
#include<stdlib.h>
#include<string.h>

#define FALSE 0
#define TRUE 1

int substring(char* main_string,char* sub_string)
{
    int flag;
    for(int i=0;i<strlen(main_string)-strlen(sub_string)-1;i++)
    {
        flag = TRUE;
        for(int j=0;j<strlen(sub_string);j++){
            if(main_string[i+j]!=sub_string[j]) flag = FALSE;
        }
        if(flag==TRUE) return i;
    }
    return flag;
}

int main()
{
    char* main[1000],sub[1000];
    printf("Enter main string:\n");
    gets(main);
    printf("Enter substring:\n");
    gets(sub);
    int pos = substring(main,sub);
    switch (pos)
    {
    case FALSE:
        printf("Substring not found in mainstring.");
        break;
    default:
        printf("Substring found in mainstring in position %d.",pos);
        break;
    }
    return 0;
}
```

Output:

```
PS X:\sem3\ds_lab> ./substring
Enter main string:
PES UNIVERSITY
Enter substring:
VERS
Substring found in mainstring in position 7.
```

Task 2: Recursive function to generate all permutations of a given text

Code:

```c
#include<stdio.h>
#include<string.h>

void swap(char* x,char* y)
{
    char temp;
    temp=*x;
    *x=*y;
    *y=temp;
}

void permute(char* a,int l,int r)
{
    if(l==r) printf("%s\n",a);
    else
    {
        for(int i=l;i<=r;i++)
        {
            swap((a+l),(a+i));
            permute(a,l+1,r);
            swap((a+l),(a+i));
        }
    }
}

int main()
{
    char str[1000];
    printf("Enter string to permute:");
    scanf("%s",str);
    permute(str,0,strlen(str)-1);
    return 0;
}
```

Output:

```
PS X:\sem3\ds_lab> ./permute_string
Enter string to permute:abcd
abcd
abdc
acbd
acdb
adcb
adbc
bacd
badc
bcad
bcda
bdca
bdac
cbad
cbda
cabd
cadb
cdab
cdba
dbca
dbac
dcba
dcab
dacb
dabc
```

Task 3: Write a C program to create a record for few students containing the student details as SRN, Name, semester, marks for 5 subjects.

a. Compute the class average marks in a particular subject.

b. Sort the students based on SRN.

Code:

```c
#include<stdio.h>
struct STUDENT_RECORD{
    char* srn[20],name[50];
    int sem,srn_num;
    int marks[5];
};
typedef struct STUDENT_RECORD stud;

void stud_sort(stud*,int);
void swap(stud*,stud*);
int average(stud*,int,int);
void display_stud(stud*,int);
int main()
{
    stud st[100];
    int n;
    printf("Enter number of students:");
    scanf("%d",&n);
    for(int i=0;i<n;i++){
        printf("Enter srn,srn num,name,semester:\n");
        scanf("%s%d%s%d",st[i].srn,&st[i].srn_num,st[i].name,&st[i].sem);
        printf("Enter the 5 subject marks:");
        scanf("%d%d%d%d%d",&st[i].marks[0],&st[i].marks[1],&st[i].marks[2],&st[i].marks[3],&st[i].marks[4]);
    }
    stud* ptr = &st;
    stud_sort(ptr,n);
    display_stud(ptr,n);
    printf("Enter the subject to calculate average marks:");
    int sub;
    scanf("%d",&sub);
    printf("Average marks in subject %d=%d",sub,average(ptr,sub,n));
    return 0;
}
```

```c
void display_stud(stud* ptr,int n){
    printf("SRN\tSRN number\tName\tSemester\n");
    for(int i=0;i<n;i++){
        printf("%s\t%d\t%s\t%d\n",ptr[i].srn,ptr[i].srn_num,ptr[i].name,ptr[i].sem);
    }
}

int average(stud* ptr,int sub,int n){
    int avg=0;
    for(int i=0;i<n;i++){
        avg+=(ptr+i)->marks[sub];
    }
    return avg/n;
}

void stud_sort(stud* ptr,int n){
    for(int i=0;i<n;i++){
        for(int j=i;j<n;j++){
            if((ptr+i)->srn_num>(ptr+j)->srn_num) swap(ptr+i,ptr+j);
        }
    }
}

void swap(stud* a,stud* b){
    stud temp;
    temp = *a;
    *a = *b;
    *b = temp;
}
```

Output:

```
PS X:\sem3\ds_lab> ./stud_record
Enter number of students:5
Enter srn,srn num,name,semester:
PES2UG20CS130 130 Mythreya 3
Enter the 5 subject marks:80 90 95 100 90
Enter srn,srn num,name,semester:
PES2UG20CSXXX 123 abcabc 3
Enter the 5 subject marks:90 80 85 77 73
Enter srn,srn num,name,semester:
PES2UG20CSYYY 150 defdef 3
Enter the 5 subject marks:77 74 98 93 99
Enter srn,srn num,name,semester:
PES2UG20CSZZZ 89 pqr 3
Enter the 5 subject marks:84 70 98 97 90
Enter srn,srn num,name,semester:
PES2UG20CSAAA 240 xyz 3
Enter the 5 subject marks:89 86 67 64 87
SRN     SRN number      Name    Semester
PES2UG20CSZZZ   89      pqr     3
PES2UG20CSXXX   123     abcabc  3
PES2UG20CS130   130     Mythreya        3
PES2UG20CSYYY   150     defdef  3
PES2UG20CSAAA   240     xyz     3
Enter the subject to calculate average marks:3
Average marks in subject 3=86
```

Tower Of hanoi

Code:

```c
#include<stdio.h>

void towerOfHanoi(int n, char* from_rod, char* to_rod, char* aux_rod)
{
    if (n == 1)
    {
        printf("\nMove disk 1 from rod %s to rod %s",from_rod,to_rod);
        return;
    }
    towerOfHanoi(n - 1, from_rod, aux_rod, to_rod);
    printf("\nMove disk %d from rod %s to rod %s",n,from_rod,to_rod);
    towerOfHanoi(n - 1, aux_rod, to_rod, from_rod);
}

int main()
{
    int num_disk = 3;
    towerOfHanoi(num_disk,"A","C","B");
    return 0;
}
```

Output:

```
PS X:\sem3\ds_lab> ./tower_hanoi
Move disk 1 from rod A to rod B
Move disk 2 from rod A to rod C
Move disk 1 from rod B to rod C
Move disk 3 from rod A to rod B
Move disk 1 from rod C to rod A
Move disk 2 from rod C to rod B
Move disk 1 from rod A to rod B
Move disk 4 from rod A to rod C
Move disk 1 from rod B to rod C
Move disk 2 from rod B to rod A
Move disk 1 from rod C to rod A
Move disk 3 from rod B to rod C
Move disk 1 from rod A to rod B
Move disk 2 from rod A to rod C
Move disk 1 from rod B to rod C
```

IPL Record

Code:

```c
#include<stdio.h>
struct IPL_PLAYER_RECORD{
    char* name[100],team[100];
    int score_match[14];
};

typedef struct IPL_PLAYER_RECORD ipl;

int num_matches(ipl*,int,int);
int max_score(ipl*,int,int);
void display_player(ipl*,int);

int main()
{
    ipl arr[100];
    printf("Enter the number of players:");
    int n;
    scanf("%d",&n);
    for(int i=0;i<n;i++){
        printf("Enter Name,Team name,Player score for past 14 matches(-1 if player did not play):\n");
        scanf("%s%s",arr[i].name,arr[i].team);
        for(int j=0;j<14;j++){
            scanf("%d",&(arr[i].score_match[j]));
        }
    }
    ipl* ptr = &arr;
    display_player(ptr,n);
    printf("Chose player for number of matches:");
    int match,max;
    scanf("%d",&match);
    printf("Number of matches played by player %s is %d",arr[match-1].name,num_matches(ptr,match-1,n));
    printf("\nChose which match you want to see max score for:");
    scanf("%d",&max);
    int num = max_score(ptr,max-1,n);
    printf("The max score in match %d is %d",max,num);
    return 0;
}
```

```c
void display_player(ipl* ptr,int n)
{
    printf("\tNAME\tTEAM NAME\n");
    for(int i=0;i<n;i++) printf("%d)\t%s\t%s\n",i+1,ptr[i].name,ptr[i].team);
}

int num_matches(ipl* ptr,int buff,int n)
{
    int count=0;
    for(int i=0;i<14;i++){
        if((ptr+buff)->score_match[i]!=-1) count++;
    }
    return count;
}

int max_score(ipl* ptr,int match,int n){
    int max = 0;
    for(int i=0;i<n;i++){
        if(max<(ptr+i)->score_match[match])
            max = (ptr+i)->score_match[match];
    }
    return max;
}
```

Output:

```
PS X:\sem3\ds_lab> ./ipl_record
Enter the number of players:5
Enter Name,Team name,Player score for past 14 matches(-1 if player did not play):
ABC PES 78 39 18 9 0 0 7 18 90 104 -1 -1 -1 16
Enter Name,Team name,Player score for past 14 matches(-1 if player did not play):
DEF PES 49 28 7 81 -1 -1 -1 -1 9 89 93 101 56 -1
Enter Name,Team name,Player score for past 14 matches(-1 if player did not play):
PQR PES 33 37 89 90 1 0 -1 -1 -1 -1 -1 37 65 90
Enter Name,Team name,Player score for past 14 matches(-1 if player did not play):
XYZ PES 38 68 19 56 29 189 80 17 26 -1 75 89 -1 -1
Enter Name,Team name,Player score for past 14 matches(-1 if player did not play):
FFF PES 29 71 87 60 69 -1 -1 58 90 91 139 59 90 90
        NAME    TEAM NAME
1)      ABC     PES
2)      DEF     PES
3)      PQR     PES
4)      XYZ     PES
5)      FFF     PES
Chose player for number of matches:3
Number of matches played by player PQR is 9
Chose which match you want to see max score for:6
The max score in match 6 is 189
```