Data Structures and Algorithms Lab
02. Strengthening the Basics

Lab Code: 17ECSP201 **Lab No:** 02 **Semester:** III
Date: 22 Aug, 2017 **Batch:** C2

Theme: Code. Be a Code. Do a Code.
Objective: Goofing around the learnt basics

Below listed are tasks which you will carry out in a team of two. I know the codes are handful but that's why you have got two hands!

Task 01:

Below listed are few statements about Pointers. You need to prove them by demonstrating through a C program. Pick any 05 out of given 07. The blue colored ones are compulsory.

- Pointer is a variable which holds the address of another variable
- **A globally declared pointer is automatically initialized to NULL by compiler where as locally declared is not**
- A pointer variable cannot be divided by a constant or a variable
- Two pointers cannot be multiplied or divided
- **When we increment a pointer it gets incremented by pointer data-type number of bytes**
- Modifying the address of constant pointer is not allowed
- Typecast a void pointer to integer pointer **[Marks: 50]**

Task 02:

Collect a sorted array of integer elements from the user. The task is to print the intermediate missing elements.

Example:

If the user enters the array elements as:
{1, 4, 7, 9, 10, 11, 12, 15}
Then, output has to be:
2, 3, 5, 6, 8, 13, 14
(Merging both input and output should result in all the numbers from 1 to n) **[Marks: 50]**

Task 03:

Write a program to divide the given string into two parts, repeatedly. In the main function: accept a string from the user of length 08, generate all substrings as per given constraint and display them to the user.

For example if user enters “question”, generated substrings will be,
ques, qu, es, q, u, e, s,
tion, ti, on, t, i, o, n **[Marks: 70]**

Task 04:

Accept two strings and ‘n’ value from user. Then, using pointer operations implement the function:

strncat(str1, str2, n) – concatenate the first ‘n’ characters of str2 to str1. **[Marks: 70]**

Task 05:

Pointer 01: how are you?
Pointer 02: well, am not that good. Because the user, whenever he uses me, he never initializes me. I always look garbage.
Pointer 01: oh! People! They do it to me too! ☹
(A long silence)

Pointer 02: hey, you are different. Why do you lie? You cannot be changed.
Pointer 01: But am I not supposed to be holding NULL? If not any valid ones?
Pointer 02: Dude, what you always hold will be a valid one. May not be NULL!
Pointer 01: Come on. I was just trying to make you feel better. See, atleast the user who eavesdropped this will initialize you to NULL before using.
Wont you??

Which of the following statement would be true with respect to above conversation??

A. Pointer 01 is void pointer and Pointer 02 is also a void pointer
B. Pointer 01 is a NULL pointer and Pointer 02 is a void pointer

C. Pointer 01 is a constant pointer and Pointer 02 is a void pointer

D. Pointer 01 is just a pointer like Pointer 02

E. Pointer 01 is a void pointer and Pointer 02 is a constant pointer

F. Pointer 01 is a constant pointer and Pointer 02 is just a pointer

G. Pointer 01 is a constant pointer and pointer 02 is a NULL pointer

H. Pointer 01 is a void pointer and Pointer 02 is just a pointer

I. Pointer 01 is Pointer 02 but Pointer 02 is not Pointer 01

J. Sorry, Pointers cannot talk **[Marks: 20]**

Task 06:

The local train station provides the daily train departure details. It has a registry maintained having the details of train name, number, source, destination, departure time and reach time. Provide software solution for the local train station system. Use the below mentioned structures:

```
struct time
{
  int hh;
  int mm;
  int ss;
};

struct train_details
{
  char train_name[20];
  int train_number;
  char source[20];
  char destination[20];
  struct time departure_time;
  struct time reach_time;
};
```

Support your program with following options:

- Add a new train details
- Provide all train details to passenger
- Search based on source and destination. This search should also give the total journey time, if there is a match. **[Marks: 100]**

Task 07:

Tokyo is getting all geared up to host Olympics 2020. Preparations are all in progress. The Olympiad committee is also thinking of redesigning and automating a few things. Let us look at the first step from Olympics team of designing the structures in the same regard.

The first structure captures the event details.

```
struct event
{
   char name[20];
   int duration;
   int age_limit;
   float weight_limit;
   float height_limit;
};
```

Statically initialize the above designed structure for event with atleast 05 event variables like shooting, weightlifting, archery etc.

The Next two structures talk about Olympic park created to host all the events and the volunteer details.

```
struct olympic_park
{
   char city[20];
   char country[20];
   int no_of_stadiums;
   int total_capcity;
};
```

```
struct voulnteer
{
   char name[20];
   char country[20];
   char designation[20];
   int id;
};
```

Collect the input from the user for structure olympic_park. We shall use the volunteer structure later.

The opening ceremony is already planned! The details are captured in below structures.

```
struct date
{
   int dd;
   int mm;
   int yy;
};

struct time
{
   int hh;
   int mm;
   int ss;
};

struct opening_ceremony
{
   struct date d;
   struct time t;
   char venue[20];
   int no_of_audience;
};
```

Collect the relevant input from the user for all above.

And we in India are not lagging. Preparation has started rigorously so that we will win more than 06 medals in the next game.

```
struct biodata
{
   char name[20];
   char state[20];
   float height;
   float weight;
   int age;
};

struct participant
```

```
{
   struct biodata bd;
   char sport[20];
   int medals_won;
};
```

Initialize atleast 40 different participant variables statically with atleast 5 different sports for above structure.

Now there is a final structure which captures our country details.

```
struct olympics_india
{
   struct participant p[10];
   struct voulnteer v[4];
};
```

Now output the following:

- The event details given by Olympics committee
- The Olympic park details
- The opening ceremony details
- Out of 40 players from India select at-most 10 best players where there are at max two players for each described event and output them: selection has to happen based on number of medals won within the given age, height and weight limit
- Select 04 volunteers where 02 for organizers and 02 for helpers and display them

[Marks: 150]

**** May The Force Be With You ****