

END SEMESTER ASSESSMENT (ESA) - May 2023**UE21CS141B - Problem Solving With C****Total Marks : 100.0**

- 1.a. i) Given a C program named p1.c, write the command used to only compile (and not link) p1.c.
ii) State true or false: break is an unconditional control construct which takes the control out of the enclosing loop or switch statement.
iii) Identify the compile time (if any) and link time errors (if any) in the below code. If there are no errors, write the expected output.

```
#include<stdio.h>
int main()
{
    int a=2
    int b=3;
    int *p1=&a;
    int *p2=&b;
    print("%d+%d=%d\n",a,b,*p1+*p2);
}
```

(4.0 Marks)

- 1.b. Write a C program to display the id of the student who has scored highest marks. id and marks are both integer type.
Read the number of students (n) through keyboard. Read the id and marks scored by 'n' students through keyboard.
Assume that id and marks are both distinct for all the students and greater than zero.

Input format:

First line: n - representing number of students

Next n lines: id space separated by marks scored by respective student

Output format: id of the student with highest marks

Sample input output:

```
5
5 50
6 60
8 80
7 70
4 40
8
```

(6.0 Marks)

1.c. What does the below code do? Also list the keywords in the same code.

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

```
int main()
```

```
{
```

```
    int sum = 0;
```

```
    int j;
```

```
    for(j = 0 ; j < 100 ; j++)
```

```
    {
```

```
        sum+=j;
```

```
    }
```

```
    printf("%d",sum);
```

```
    return 0;
```

```
}
```

(6.0 Marks)

1.d. Mention the phases involved in the program development life cycle of a C Program.

(4.0 Marks)

2.a. List any four differences between array and pointer.

(4.0 Marks)

2.b. Explain any three string manipulation functions with an example. (6.0 Marks)

2.c. Write a C function to compute the factorial of a number using recursion. Use it to compute $C(n,r)$.

Implement the below functions:

```
int factorial(int n);
```

Returns the factorial of the input value n

```
int ncr(int n, int r);
```

Returns the $C(n,r)$ value for the input values n and r

Input Format n r

where n and r are two positive integers, space separated, $n \geq r$

Output Format

$C(n,r)$ value for the input numbers

Sample Input 5 2

Sample Output 10

(6.0 Marks)

2.d. Explain the following commands in gdb.

i) break ii) list

(4.0 Marks)

3.a. List any four characteristics/properties of structures in C

(4.0 Marks)

3.b. In the below code, if the address of a[0][0] is 3000 and the size of integer is 4 bytes, find the address of a[1][2]. Also mention what gets printed?

```
#include<stdlib.h> int main()
```

```
{  
    int a[][2] = {3,5,6,7,8,1,99,66,33,15,36};  
    printf("%d",a[1][2]);  
    return 0;  
}
```

(4.0 Marks)

3.c. struct Car

```
{  
    int year;        char company[100];    char color[100];  
}; typedef struct Car CAR;
```

Given the above structure definition and alias for it, write the C statements for the following.

- i) Create a pointer to structure.
- ii) Allocate memory for all the members of the structure dynamically
- iii) Assign values to all the members of the structure through this pointer.

(6.0 Marks)

3.d. There is a structure called student and two data members in it such as name and age. Write the code to do the following.

- i) Create a structure variable s
- ii) Create a pointer to structure variable which points to s
- iii) Display name using pointer
- iv) Display age using s
- v) Create a structure variable s1 and copy the contents of s to s1. Write the code snippet to compare s1 and s

(6.0 Marks)

4.a. Implement Binary search using recursive method on an array of 100 integer elements which are stored in ascending order. Handle both successful and unsuccessful search.

Given the array, int a[] = {100,98,76,54,44,43,42,40,31,30};

Write only the function definition. Client code is not a requirement (6.0 Marks)

4.b. Below code must write the details from age and name arrays to a data file named emp.txt. Data from the same indices must be copied to a file in one row separated by a space. Fill up the blank spaces to do the same.

```
#include<stdio.h>
int main()
{
    int age[ ] = {34,45,32,54,44};
    char name[][50] = {"raj","rajesh","anil", "anitha","rajendra"};
    FILE *fp = fopen("emp.txt","w");
    if(_____)
    {
        for(int i = 0 ; i < 5; i++)
        {
            fprintf(fp,"_____\n",age[i],name[i]);
        }
    }
    fclose(fp);
    return 0;
}
```

(4.0 Marks)

4.c. Given a dataset containing the details of trains from Bangalore to Mumbai(sample given below), sort it based on the availability and based on the cost separately using selection sort algorithm.

PNR	Train_name	Source City	Destination city	Cost	Availability
22416	AndhraPradesh Express	Bangalore	Mumbai	1000	7
12724	AndhraPradeshExpress	Bangalore	Mumbai	500	56
12707	Andhra Pradesh Sampark Kranti	Bangalore	Mumbai	800	10
15909	Abadh Assam Express	Bangalore	Mumbai	1000	67
18242	Abkp Durg Passenger E	Bangalore	Mumbai	800	3
11266	Abkp Jbp Express	Bangalore	Mumbai	600	6
58702	Abkp Sdl Passenger	Bangalore	Mumbai	750	4
54703	Abs Ju Passengr	Bangalore	Mumbai	850	80
7509	Adb QIn Special	Bangalore	Mumbai	900	66
9416	Adi Madgaon Special	Bangalore	Mumbai	450	48

The new type struct Train is used to store the detail of each train. The array train_arr contains the data from the dataset. Sort the data in the array of structures as per the requirement in the client code. n is the number of train details from the file.

Include the definitions of compare_availability and compare_cost functions
struct Train

```
{
    char name[100]; int cost;
    int availability_count;
};
typedef struct Trian TRAIN;
int main()
{
    TRAIN train_arr[10000];
    // Code to read the contents from the datafile and storing those details in the array
    of structure is available here. Please DO NOT add that code here
    int ch;
    printf("enter the choice.\n1. sort on availability\n2. sort on cost\n");
    scanf("%d",&ch);
    switch(ch)
    {
        case 1: sort(train_arr, n, compare_availability);
                break;
        case 2: sort(train_arr, n, compare_cost);
                break;
        default: printf("exiting from the program");
                break;
    }
    return 0;
}
void selection_sort(TRAIN *t, int n, int (*com)(TRAIN*,TRAIN*))
{
// fill this implementation
}
```

(6.0 Marks)

4.d. Explain array of pointers to integers with a code snippet.

(4.0 Marks)

5.a. Write a program to accept integer values in the command line and display the product of those integers. (4.0 Marks)

5.b. List out any four characteristics of macro in C. Also find the output of below code.

```
#include<stdio.h>
#define SUM(a,b) a*b
int main()
{
    printf("%d",SUM(5+2,2+1));
    return 0;
}
```

(6.0 Marks)

5.c. **Say True or False**

- i) Array of bit fields is allowed
 - ii) Bit fields with a length of 0 must be unnamed
 - iii) Accessing the Variable length Arguments from the function body makes use of macros available in stdarg.h
 - iv) Storing the symbol of one enum in another enum variable is invalid in C.
- (4.0 Marks)

5.d. i) The below code results in

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

```
enum Sample
```

```
{
```

```
    A, B=8, C, D
```

```
};
```

```
int main()
```

```
{
```

```
    enum Sample s = B;
```

```
    printf("%d\t%d\n", s+C, s+A);
```

```
    return 0;
```

```
}
```

ii) What is a storage class in C? Explain static with an example code snippet.

(6.0 Marks)