B. Tech-2nd(Sec-A,B,C,K,L,M &N)

C and Data Structures

Full Marks : 50

Time : $2\frac{1}{2}$ hours

Answer **all** questions

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer *all* questions : 2×5

(*a*) What is the output of the following program ? Justify.

```
#include <stdio.h>
int main()
{
   int i = 1 ;
   do
   {
      printf("%d\n", i);
      i++;
      if (i < 15)
```

```
        break;
    } while(1);
    getchar();
    return 0;
}
```

(b) Write the syntax for declaration and initialization of a 2-D array with an example.

(c) Differentiate between Array and Structure with suitable example.

(d) State the differences between linear and non-linear data structures with suitable examples.

(e) Discuss the characteristics of a Binary search tree.

2. **(a)** WAP to find the sum of the following series :

$1 + x + x^2 + x^3 + \ldots\ldots + x^n$ where, x and n are to be inputted through user. 4

(*b*) Draw a Flowchart to calculate the sum of the digits of a number. 4

Or

(*a*) Discuss the following operators with suitable examples 4

(*i*) Prefix Increment Operator

(*ii*) Postfix Decrement Operator

(*iii*) Conditional Operator

(*iv*) Comma Operator

(*b*) WAP in C to generate the following pattern : 4

```
1
1  2
1  2  3
1  2  3  4
```

3. (*a*) Write a C program to swap two numbers using functions by the following parameter passing methods 4

(*i*) Call by value

(*ii*) Call by reference

(*b*) Write a C program to create a structure named *student* that has *name, rollno, dob* and *marks* as members. Write a program to read the data from user for *n* number of students (*n* has to be entered by the user) and display the student details. 4

Or

(*a*) Write a C program to find the reverse of a given string. Demonstrate with suitable output. 4

(*b*) Write a C program along with sample output to compute the transpose matrix of a given 4×4 input matrix. 4

4. (*a*) Write a C program to illustrate the use of pointers in the following arithmetic operations : 4

(*i*) Addition of integer to a Pointer

(*ii*) Subtraction of integer from a Pointer

(*b*) What is dynamic memory allocation ? WAP to illustrate the use of Dynamic Memory Allocation in an array using malloc(). 4

Or

(*a*) Write a 'C' program to compute the sum of all elements stored in an array using pointers. 4

(*b*) What is dangling pointer ? How is it different from a null pointer ? 4

5. (*a*) Evaluate the following postfix expression : 4

5, 6, 2, -, *, 2, 2, +, /, 3, *.

(*b*) Write the algorithms for PUSH and POP operations in a STACK. 4

Or

(*a*) Convert the following infix expression to a postfix expression : 4

$(A+B)*C+D/(E+F*G)-H$

(*b*) What is the advantage of circular queue over a linear queue ? Write the underflow and overflow conditions of linear queue and circular queue. 4

6. (*a*) Explain the binary search algorithm with an example. 4

(*b*) Make a BST for the following sequence of numbers : 4

45, 36, 76, 23, 89, 115, 98, 39, 41, 56, 69, 48.

Or

(*a*) Explain the Bubble sort algorithm with a suitable example. 4

(*b*) What is binary search tree ? How it differs from binary tree ? Explain with example. 4
