1. (a) (i) State the function of a *pivot element* as used in data structures. (2 marks)

(ii) Outline the function of a *break* statement as used in programming. (2 marks)

(iii) State **two** circumstances under which *iteration* would be used in a program. (2 marks)

(b) (i) Describe the term *binary tree* as used in data structures. (2 marks)

(ii) Distinguish between the *program designing* and *program coding* stages of system development. (4 marks)

(c) The following is a list of key words used in programming:
if, Const, define, write, double, Char, float
Identify **four** C programming language keywords from the list. (2 marks)

(d) Figure 1 shows data in an input file. Use it to answer the question that follows.

Item Name	**Shop1**	**Shop2**	**Shop3**
Tooth paste 100g	80	85	90
Wheat flour 2 Kgs	120	119	121
Cooking Oil 3 Ltrs	520	518	522

Figure 1

Write a Pascal program that reads the data from the input file and produces the output as follows. (6 marks)

Item Name	Shop1	Shop2	Shop3	Highest price
Tooth paste 100g	80	85	90	90
Wheat flour 2 Kgs	120	119	121	121
Cooking Oil 3 Ltrs	520	518	522	522

2. (a) (i) Outline **one** advantage and **one** disadvantages of using *bubble sort* algorithm to sort elements in a program. (2 marks)

(ii) State **four** examples of *white space* as used in C programming. (2 marks)

(b) (i) Explain **one** importance of *external documentation* as applied in programming. (2 marks)

(ii) With the aid of an example, explain the purpose of a *comment* in a C program. (3 marks)

(c) The following is a C program. Use it to answer the question that follows.

```
#include <stdio.h>
 main(){
   int n, c;
printf("Enter a number\n");
   scanf("%d", &n);
if ( n == 2 )
      printf("Number.\n");
   else
   {
       for ( c = 2 ; c <= n - 1 ; c++ )
       {
           if ( n % c == 0 )
              break;
       }
       if ( c != n )
          printf("Not correct.\n");
       else
          printf("Number.\n");
   }
   return 0;
}
```

Given that a user entered 15 as the value of n, write the output from the program. (4 marks)

(d) Write a Pascal program that accepts heights of 10 students and stores them in an array, the program should then prompt the user to enter a height and then search through the array of entered heights to check whether the height entered is found. If the height is found then the program displays "found" otherwise "not found". (7 marks)

3. (a) (i) Define the term *modular programming*. (2 marks)

(ii) Outline **two** methods of *passing parameters* to a subprogram. (2 marks)

(b) (i) Describe the general syntax of a *case control* structure as used in Pascal programming. (2 marks)

(ii) Explain a circumstance under which an *endless* loop may occur in a program. (2 marks)

(c) Given that a=6, b=4, and c=10. Compute the output from each of the following C statements.

(i) (a>6)&&((a*c)<b) (2 marks)

(ii) (a<=b) ||(a*c)>(a*b) (3 marks)

(iii) (a*b)/2+(c/2*b) (1 marks)

(d) Ann, a computer student, intends to write a program that computes the total and average of all the even numbers from 20 to 50. Draw a flowchart to represent the logic of the program.

(6 marks)

4. (a) Outline **two** disadvantages of *monolithic* programming. (2 marks)

(b) (i) Describe **two** features of *third generation programming* languages. (4 marks)

(ii) Differentiate between a *text file* and a *record* as used in programming. (4 marks)

(c) (i) Differentiate between *for loop* and *switch* control structures. (4 marks)

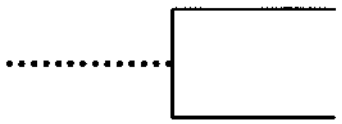
(ii) Under what circumstance would a *continue* command be used in a C program. (2 marks)

(d) With the aid of an example, describe *divide* and *conquer* algorithms as used in data structures. (4 marks)

5. (a) Define the term *structure* as used in C programming. (2 marks)

(b) Explain the function of each of the following flowchart symbols:

(i)  (2 marks)

(ii)  (2 marks)

(c) (i) Charles, a computer student, intends to write a computer program that would be used to generate the following output.

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

Represent the logic of the program using a flowchart. (5 marks)

(ii) The following is a C program segment. Use it to answer the question that follows.

```
int main<>
{
      int number;
      char symbol;
      for(i=1;i=10; i--)
      {
            scanf("intial");
            printf(symbol);
            printf(/n);
      }
}
```

Identify **six** errors in the program. (3 marks)

(d) Write a C program that accepts ten characters using a loop, determines the number of capital letters and small letters. The program should then output the number of capital letters and the number of small letters entered. (6 marks)

6. (a) State the function of the *goto* command as used in C programming. (2 marks)

(b) (i) Explain the use of each of the following debugging techniques as used in C programming:

I. tracing; (2 marks)

II. stepping. (2 marks)

(ii) Ann would like to write a program that reads records from a text file. Justifying your answer, outline **two** appropriate control structures that she would use. (2 marks)

(c) Write a Pascal program that accepts a character from the keyboard. The program should then determine whether the character appears before or after letter K in the alphabet. The program should then output an appropriate comment e.g. appears before or after. (6 marks)

(d) Write a C program that prompts a user to enter the number of elements in a list to be sorted and then the elements themselves. The program should then bubble sort the elements in ascending order and output the sorted list. (6 marks)

7. (a) (i) State the function of the *stdio.h* command as used in C programs. (2 marks)

(ii) State the circumstance under which an *extreme* test data would be used in programming. (2 marks)

(b) Explain **two** reasons that necessitate the use of *functions* in a program. (4 marks)

(c) (i) State **two** benefits of using *structure charts* when designing a program.(2 marks)

(ii) Amanda, a computer student, chose to use the *switch* statement instead of *if* statement while developing a program. Justifying your answer, explain a reason that prompted the student to make that choice. (2 marks)

(d) Write a C program that uses three functions named circle, cube and sphere to calculate the area of a circle, volume of a cube and volume of a sphere respectively. The program prompts the user to select one of the functions and prompts the user to enter the dimensions for the
sphere $=4/3 * \pi r^3$ (8 marks)

8. (a) (i) Outline the function of each of the following Pascal programming declarations:

I. type; (1 mark)

II. label. (1 mark)

(ii) Explain **one** effect of a *logical error* in a program. (2 marks)

(b) Differentiate between a *pointer* and a *linked list* as used in data structures. (4 marks)

(c) Distinguish between an *array* and a *queue* as used in data structures. (4 marks)

(d) Write a Pascal program that accepts a number less than or equal to 10 but greater than 1. The program should then compute and output the factorial of the number through the use of a procedure. (8 marks)