1. (a) (i) Explain the term *parameter passing* as used in programming. (2 marks)

(ii) Write a C program that prompts the user to enter an integer. The program should then determine whether the input is odd or even and output appropriate message. (4 marks)

(b) (i) James entered an integer in a Pascal program during execution and the following output was displayed 3.08000E+0.155000E.

I. Outline the cause of the output as displayed. (1 mark)

II. State a possible solution that could make the output easy to read. (1 mark)

(ii) Figure 1 shows a flowchart of a program designed by a student in a programming class. Use it to answer the question that follows.

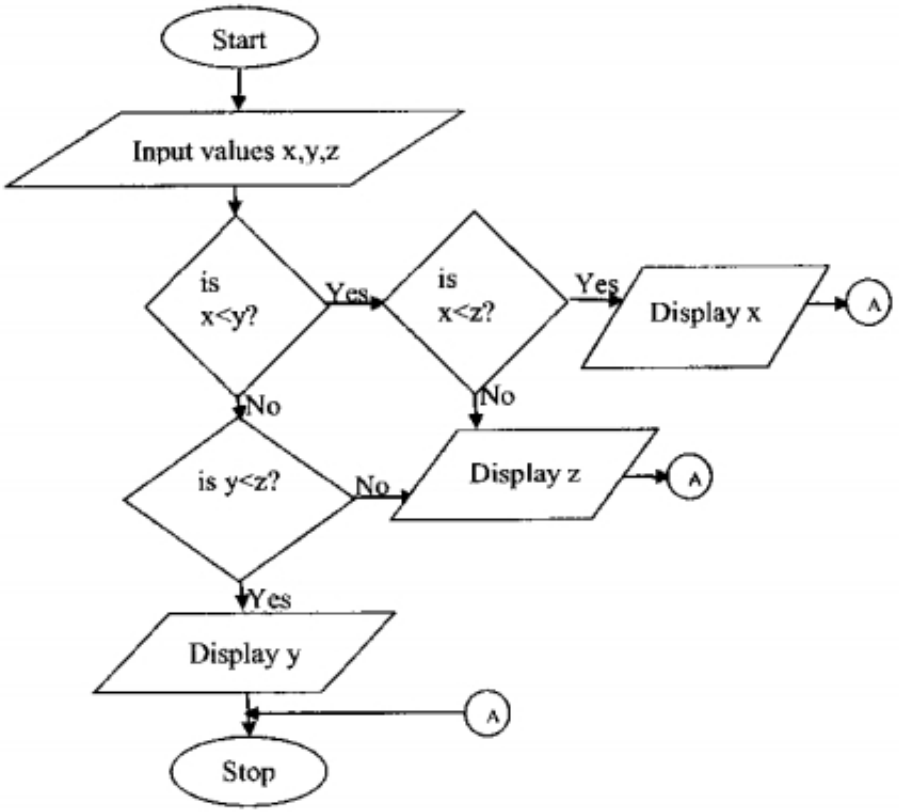

Figure 1

Write a Pascal program that could be used to implement the program logic. (4 marks)

(c) Differentiate between an *interpreter* and an *assembler* as used in programming. (4 marks)

(d) Write a C program that would prompt the user to enter the length and breadth of a rectangle. The program should then compute and output the area and perimeter of the rectangle. (4 marks)

2. (a) (i) List **two** inbuilt Pascal functions that could be used to store the results of a real expression as an integer. (1 mark)

(ii) With the aid of an example outline the structure of a compound statement as used in Pascal Programming. (1 mark)

(iii) Distinguish between *object oriented programming* and *visual programming* paradigms. (4 marks)

(b) Write a Pascal program that would be used to read 10 scores into an array named D. The program should then compute the average score and display average score and the scores greater than the average. Use a *while...do* loop to read data. (6 marks)

(c) Write a Pascal program that would prompt the user to input values of m , n, p, q and then computes the value of z which is the product of m and n and value of c which is the sum of p and q through a procedure beta. Then program display the results from beta procedure. (4 marks)

(d) With the aid of an example in each case, differentiate between *prefix* and *postfix* decrement operators as used in C programming. (4 marks)

3. (a) (i) State **three** file handling commands that are used in C programming. (3 marks)

(ii) Differentiate between *reset* and *rewrite* procedures as used in Pascal text files. (4 marks)

(b) Explain **two** advantages of a loop control structure as used in programming. (4 marks)

(c) Write an algorithm that could be used to remove an element from a stack. (4 marks)

(d) Write a C program that would accept an integer. If the integer has one digit, the total sum is the integer otherwise the total sum is the digits in the integer. Use a recursive function. (5 marks)

4. (a) (i) Outline **four** properties of an *array* data structure. (2 marks)

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

```
#include<stdio.h>
int  & max(int & x, int & y)
{
        if (x>y)
        return x ;
        else
        return y;
}
main()
{
        Max(a,b);
}
```

Interpret the program. (3 marks)

(b) Tom, an IT student was given a task to test a Pascal program under development. Explain **two** characteristics that could help him ascertain that the program contains a function. (4 marks)

(c) (i) Write a Pascal program that could be used to generate squares of even integers between 12 and 30. Use *Repeat .... Until* loop. (4 marks)

(ii) Explain a circumstance that makes *goto* statement unpopular. (2 marks)

(d) (i) Construct a binary tree for the following nodes 20, 10, 21, 5, 9, 4, 17. (2 marks)

(ii) With reference to the binary tree constructed in (i), explain each of the following terms:

I. siblings; (1 mark)

II. ancestors; (1 mark)

III. terminal. (1 mark)

5. (a) State **four** characteristics of a good program. (2 marks)

(b) (i) Identify a type of an error which could arise from each of the following scenarios in Pascal programming:

I. a missing semicolon; (1 mark)

II. erroneous output; (1 marks)

III. program terminated prematurely due to wrong input; (1 mark)

IV. error due to certain combinations of data. (1 mark)

(ii) For each of the errors identified in (i). State the stage in which the error is encountered. (2 marks)

(c) (i) Differentiate between *dummy* and *exceptional test data* as used in programming. (4 marks)

(ii) Specify the function of each of the following delimiters as used in C programming:

I. ( ) (1 mark)

II. [ ] (1 mark)

III. { } (1mark)

(d) Write an algorithm that could be used to represent binary search logic. (5 marks)

6. (a) Define the term *identifier* as used in programming. (2 marks)

(b) With the aid of an example in each case, differentiate between *DIV* and *MOD* operators as used in Pascal programming. (4 marks)

(c) (i) I. Declare a record in Pascal named *class* with a variable name *classrecord* that contains the following items; student number, name, and a list of five test scores. (2 marks)

II. Explain the use of *with statement* as used in Pascal programming. (2 marks)

(ii) The following list of scores was read into a structured program as it appears: 56, 37, 75, 22, 10. Trace the passes and steps that would be followed to sort the list in ascending order using bubble sort method. (4 marks)

(d) (i) Define a *pointer* as used in programming. (2 marks)

(ii) Distinguish between *inorder* and *post order* tree traversals. (4 marks)

7. (a) Write the conversion specification of each of the following as used in C programming:

(i) Octal numbers; (1 mark)

(ii) Hexadecimal numbers; (1 mark)

(iii) Single character. (1 mark)

(b) With the aid of an example in each case, describe each of the following data types as used in Pascal programming:

(i) subrange; (2 marks)

(ii) enumerated. (2 marks)

(c) (i) Outline the feature that makes *low level* language inconvenient to use. (2 marks)

(ii) Outline **four** characteristics of a *high level* programming language. (4 marks)

(d) Table 1 shows the water billing criteria in a certain town. Use it to answer the question that follows.

	Units used	Price per unit (Ksh)
1.	70 and above	120
2.	60 < units < 69	80
3.	40 < units < 59	60
4.	0 < units < 39	30

Table 1

Write a Pascal program that accepts the current and previous meter readings, the program then computes and outputs amount payable by a client.

Note: A standing charge of Ksh.120 is chargeable for all customers regardless of units used.

(7 marks)

8. (a) Outline the use of each of the following Pascal functions:

(i) CHR; (1 mark)

(ii) SUCC. (1 mark)

(b) (i) Outline **two** properties of a linear data structure. (2 marks)

(ii) Mary was given a task to create a program for a certain college. She noted that the college is made up of several departments with distinct functionalities.

I. State the most appropriate programming approach she could use. (1 mark)

II. Outline **three** advantages of the approach stated in I. (3 marks)

(c) Write a Pascal program to read twelve integers in an array named Q in row wise order of four elements per row. The program then outputs the resultant array. (4 marks)

(d) (i) Name **three** predefined mathematical functions used in Pascal programming. (3 marks)

(ii) Write a logical statement for each of the following as used in C programming:

I. Medical allowance is more than 2250 for the staff whose job group is not K. (1 mark)

II. Stock below 200 for itemno_100 or in shop A. (1 mark)

(iii) The following is a segment of a C program created by a student. Use it to answer the question that follows.

```
main ()
{
int i;
for(i=1;i<=50;i++)
if(i%7==0)
printf("%d",i)\n;
}
```

Write the output generated when the program segment is executed. (3 marks)