1. (a) (i) Outline **two** advantages of using assembly language to create a program. (2 marks)

(ii) Distinguish between *procedural* and *non-procedural* programming languages. (4 marks)

(b) Explain **two** reasons that would make a programmer to opt for top-down design when developing a program. (4 marks)

(c) Assuming Pascal programming language, evaluate the expression;

```
Y = sqr(a) + b * c mod 4 / d
```

given that a = 4, b = 6, c = 10 and d = 3. (4 marks)

(d) A technical institute allocates hostels to students on first come first served basis. A student first registers for the term, pays fees and then applies for a hostel room. A room is allocated to students who meet this criterion.

Draw a flow chart to represent the logic in the narrative. (6 marks)

2. (a) (i) Explain the term *user-defined data type* as used in programming. (2 marks)

(ii) A programmer created a program for a hospital to store patient details as a single entity consisting of: *PatientNo*, *Patient_Name*, *Gender* and *Age*.

(I) Identify the most appropriate data structure the programmer could have used. (1 mark)

(II) Using Pascal language declare a data structure that could be used to store this data. (4 marks)

(b) (i) Outline **three** operations that may be carried out on a stack data structure. (3 marks)

(ii) Distinguish between *queue* and *linked list* data structures. (4 marks)

(c) Table 1 shows the criteria used by Tusome Technical Institute to award grades to students. Use it to answer the question that follows:

Points	Grade
1	Distinction
2	Credit
3	Pass
4	Fail

Table 1

Write program in C language that would prompt a user to enter the points obtained by a student. The program then displays the corresponding grade. Use *switch* statement. (6 marks)

3. (a) (i) Explain **two** characteristics of an algorithm. (4 marks)

(ii) Write an algorithm that could be used to implement a quick sort. (4 marks)

(b) Write a program in C language that would prompt a user to enter an integer. The program then checks whether the integer entered is a prime number or not and displays an appropriate message. (6 marks)

(c) Write a program in Pascal language that prompts a user to enter a positive integer. The program then computes the sum of all integers from 0 to the integer. (6 marks)

4. (a) Outline **two** types of utility programs used in program translation. (2 marks)

(b) (i) A student created a program that could write data into a file. Describe **three** file organization techniques he could have used. (6 marks)

(ii) The following is C language program. Study and use it to answer the question that follows.

```
#include <stdio.h>
int main ()
{
int Myarray[ 4 ]={10,20,30,40};
int j;
for (j = 3; j >= 0; j-- )
        {
        printf("Element[%d] = %d\n", j, Myarray[j] );
        }
return 0;
}
```

Interpret the program line by line. (4 marks)

(c) (i) Describe the term *comment* as used in Pascal programming language. (2 marks)

(ii) Figure 1 shows the floor area of a rectangular room that has been fitted with a circular carpet. Use it to answer the question that follows.

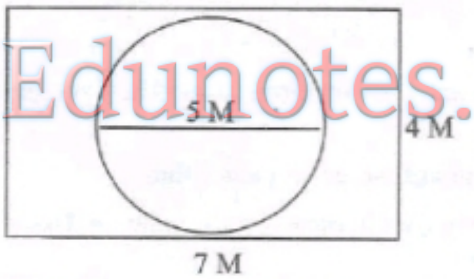

Figure 1

Write a program in Pascal language to compute the area not covered by the carpet. (6 marks)

5. (a) (i) Explain the term *module* as used in programming. (2 marks)

(ii) State **two** differences between a *function* and a *procedure* as used in Pascal language. (4 marks)

(b) Write a pseudocode that could be used to sort items in a list using bubble sort technique. (4 marks)

(c) Outline the use of each of the following C language file functions.

(i) putc( )

(ii) fprintf( ) (4 marks)

(d) Write a program in C language that could be used to generate the following output.

```
4
4       5
4       5       6
```

(6 marks)

6. (a) Outline **two** reasons for using data structures in a program. (2 marks)

(b) (i) Describe **two** types documents that could be included in a new program. (4 marks)

(ii) Distinguish between *writeln( )* and *write( )* functions as used in Pascal. (4 marks)

(c) Given the data items: *Peter, George, Tom, Beatrice, Wayne, Joan* and *Ray*.

(i) Construct a binary tree; (3 marks)

(ii) State the level of the data item *Ray* in the binary tree in (i). (1 mark)

(d) A program prompts a user to enter the code '1234' in order to log in to a system. If the entered code is correct a message "Welcome" is displayed otherwise a message "The code is incorrect" is displayed. The program allows up to a maximum of three entries.

Write a program in Pascal language that could be used to implement this logic. (6 marks)

7. (a) Explain the use of each of the following reserved words in structured programming.

(i) break;

(ii) continue. (4 marks)

(b) Distinguish between *realloc* and *free* functions as used in C programming language. (4 marks)

(c) (i) Outline **two** advantages of merge sort algorithm. (2 marks)

(ii) Figure 2 shows a list of data items in a data structure. Use it to answer the question that follows.

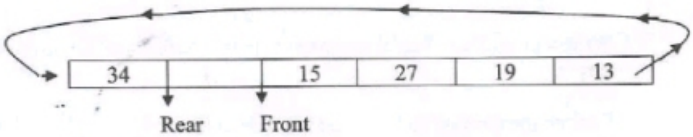

Figure 2

Describe the data structure depicted in the figure. (4 marks)

(d) Write a program in Pascal language that could be used to create a two by two array and enter values into the array. (6 marks)

8. (a) (i) State **two** ways other than comments through which a programmer could make a program more understandable. (2 marks)

(ii) A student created a program using C language; identify an escape sequence he could use to format the output as a table. (2 marks)

(b) Outline the meaning of each of the following escape sequences as used in C programming language.

(i) \a

(ii) \b

(iii) \\

(iv) \0 (4 marks)

(c) (i) Outline **two** types of errors that one could encounter when working with a stack. (2 marks)

(ii) Describe **two** error trapping functions used in C programming language. (4 marks)

(d) Table 2 shows the criteria used by a county government to allocate bursaries to students. Use it to answer the question that follows.

Status	Amount Allocated
Orphan	15,000
Needy	13,000
Affirmative Action	13,000
Other	0

Table 2

Write a program in Pascal language that would prompt a user to enter the status of a student. The program then outputs the amount allocated to the student. Use *nested if* statement. (6 marks)