UNIVERSITY OF GHANA

B.SC INFORMATION TECHNOLOGY, FIRST SEMESTER EXAMINATIONS: 2016/ 2017

CSIT105 – PROGRAMMING FUNDAMENTALS (3 CREDITS)

INSTRUCTION:

The question paper consists of two sections, Section A and Section B.

*In Section A, attempt **All** questions. In Section B, answer question **B1** (compulsory) and any other one. Write your answer in the booklet to be provided.*

TIME ALLOWED:

TWO AND A HALF (2½) HOURS

Section A

Compulsory (50 MARKS)

A1. List the stages of programming methodology. [3 marks]

A2. List any four classes of lexical symbols of most programming languages. [2 marks]

A3. Define the term algorithm. [2 marks]

A4. Write the interpretation of the following EBNF Rules: [8 marks]

a. <statement> ::= <assignment> | <loop>

b. <expression> ::= <value> | <value> + <value> | <value> <= <value>

c. <assignment> ::= <identifier> := <expression>

d. <loop> ::= while <expression> do <statement>$^{+}$ done

A5. Compare and contrast compiler and interpreter. [4 marks]

A6. Distinguish between declarative languages and imperative languages. [2 marks]

A7. List the major principles of imperative programming paradigm. [3 marks]

A8. Write the following algebraic expression in C++ syntax. [3 marks]

$y = x^2 + 5bc - d((b - c))$

A9. Differentiate between syntax errors and logical errors. [2 marks]

A10. List any four methods or concepts of object-oriented programming paradigm.[2 marks]

A11. List any four aims of Program design. [2 marks]

A12. Distinguish between System specification and Program specification. [2 marks]

A13. For the ASCII symbol P write [4 marks]

I. its decimal code equivalent

II. its binary code equivalent

A14. How is complexity measured in programming? [2 marks]

A15. List the three main programming constructs of structured programming. [3 marks]

A16. What is parallel programming ? [4 marks]

A17. What is the nature of Parallel Computer System? [2 marks]

Section B (50 Marks)

*In this section, answer questions **B1** (compulsory) and **any other one**.*

B1. (***30 marks)***

Given below in Figure 1 is a C++ main() function code. It contains syntax errors.

Figure 1. A C++ main() function code

1. #include <”iostream”>;
2. #I am to write out the short form of this function that will optimise its compilation and execution;
3. #Also, I am required to correct all Syntax errors, not logical errors;
4. #Using namespace std;
5. Int main()
6. {
7. unsigned long int big;
8. unsigned long int small;
9. unsigned long int medium;
10. double fn{50};
11. double sumfn = 0;
12. double myvalue;
13. unsigned short int count1;
14. unsigned short int count2;
15. unsigned short int count3;
16. for(count1 = 0, count1 <= 50 , count1 = count1 + 1) ;
17. {

```
18.  If ( count1 = 2)  ;
19.      {
20.          fn{count1} = fn{count1 -1 } + fn{count1 – 2};
21.      }
22.      else if
23.          {
24.              fn{count1} = count1 ;
25.          }
26.  }
27.  for(count2 = 0, count2 <= 50, count2 ++2) ;
28.  {
29.      sumfn  = sumfn + fn{count2};
30.      cout  >> fn{count2}
31.      cout >> endl;
32.  }
33.  cout >> “The Sum Is   “
34.  cout >> sumfn
35.  cout >>  endl;
36.  System “{Pause}”;
37.  return sumfn;
38.  }
```

Required:

Rewrite

- the **optimised** *(i.e. the short form of statements and declarations)* and
- **syntax error free** form of the main() function in your **answer booklet**.

B2. ***(20 marks)***

Given a 5 by 5 integer array of data elements :-

3	6	4	14	8
9	1	2	7	4
2	7	3	2	5
4	1	1	2	3
1	2	3	2	2

Note: The directed arrow shows the elements on the principal diagonal of the array.

Required:

Write a C++ -language program to do the following:

I. Find the **product** of the elements on the **principal diagonal** and **print it out**.

II. Find the **sum** of the elements in each column and keep **the sum in the 6th cell in each column. (***Hint: declare the array to cater for the sum)*

B3. (***20 marks***)

You have been commissioned to write a C++ program that will display a bar graph showing the number of students who voted in the 2016/2017 University of Ghana SRC elections by halls. The sex distribution of number of students who voted in a hall is shown in the table below:-

Name OF HALL No of female students

	who voted	No of male students who voted	TOTAL vote cast
AKUAFO	330	250	580
COMMONWEALTH	120	200	320
LEGON	440	300	740
MENSAH SARBAH	450	350	800
VOLTA	250	250	500

The input to the program is keyed hall by hall. For each hall the number of female votes cast is first keyed followed by the number of male votes cast. The Total votes cast by the hall is then determined by summing the female votes cast and the male votes cast.
The number of students in a hall is always greater than zero.

The output will consist of a bar graph in the following form:

UNIVERSITY OF GHANA
A BAR GRAPH SHOWING DISTRIBUTION OF TOTAL VOTES CAST BY HALLS IN THE SRC ELECTIONS (2016/2017)

HALL NAME	TOTAL	BAR GRAPH
AKUAFO	580	**********
COMMONWEALTH	320	**********
LEGON	740	**********
MENSAH SARBAH	800	**********
VOLTA	500	**********

EACH ASTERISK in the bar graph equals 20 votes casts

Required :

Write a C++ language program

I. that will accept the input data from each hall, female votes and male votes
II. calculate the total votes cast per hall and
iii. display the results as shown above
iv. also display the overall Total votes cast in the elections

B4. **(*20 MARKS*)**

The percentage of revenue spent on Research and Development by 10 companies are as presented in the table below:

Company No. (i)	% Revenue (x_i)
1	13.5
2	7.2
3	9.7
4	11.3
5	8.0
6	9.5
7	7.1
8	7.5
9	5.6
10	7.4

Required:

a. Design an algorithm to calculate the

I. sum of %Revenue and

II. the average %Revenue for these measurements.

a. Draw the flowchart to implement the algorithm.