UGANDA INSTITUTE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
END OF SEMESTER ONE EXAMINATIONS

ACADEMIC YEAR 2024/2025

DEPARTMENT: ICT

SEMESTER: ONE

PROGRAMME(S): DIPLOMA IN COMPUTER SCIENCE (DCS)
DIPLOMA IN ELECTRONICS COMMUNICATIONS ENGINEERING (DECE)

YEAR OF STUDY: ONE

COURSE: PRINCIPLES OF COMPUTER PROGRAMMING

COURSE CODE : CSC111

DATE: MONDAY 16TH, DECEMBER 2024

TIME: 9:00 AM – 12:00 NOON

DURATION: 3 HOURS

INSTRUCTIONS:

(i) This paper contains two Sections: A (40 marks) & B (60 marks).

(ii) Attempt ALL questions in Section A, and ONLY THREE questions in Section B.

(iii) All questions in Section B carry equal marks.

(iv) Credit will be given for use of relevant examples and illustrations.

(v) Begin each number in Section B on a new page of the answer sheet.

(vi) DO NOT write on this question paper.

SECTION A [40 MARKS]

Attempt **ALL** the Questions in this Section.

Question 1

a) Explain the difference between a syntax and semantics **(4 marks)**

b) What is the difference between a variable and a constant as used in Programming **(2 marks)**

c) Explain the meaning of the following terms **(8 marks)**

   i) Arrays

   ii) Classes

   iii) Keywords

   iv) Exceptions

d) Explain any four data types that represent numbers **(4 marks)**

e) A number is said to be **double-even** if it is divisible by both 4 and 6. For example, 24 is double-even because it is divisible by both 4 and 6. Design a flowchart/algorithm that allows a user to input a number and check if it meets the above condition **(6 marks)**

f) Indicate whether the following statements are TRUE or FALSE. For each, show how you arrived at the answer. Assume the statements are syntactically correct **(8 marks)**

   i) The output of the expression (8 > 5) && (4 != 4) is true

   ii) The output of the expression (15 / 3) * 2 == 10 is false

   iii) The output of the expression (7 % 4) == 3 is true

   iv) The output of the expression (12 >> 2) == 3 is false

g) Programming languages are either compiled or interpreted. Explain the meaning of the statement. **(4 marks)**

h) Given the following expression in postfix notation: **5 3 2 * + 8 –**
   Convert the expression into **infix** notation and show the steps of your conversion process. **(4 marks)**

SECTION B [60 MARKS]

Attempt **ONLY THREE** Questions in this Section.

Question 2

a) Briefly explain any **three** types of programming errors **(6 marks)**

b) An employee qualifies for a performance bonus; If their annual performance rating is 4.0 or higher (on a scale of 1.0 to 5.0), they are entitled to a 10% bonus of their annual salary. If the rating is between 3.0 and 3.9, they are entitled to a 5% bonus. If the rating is below 3.0, they receive no bonus. Ensure the algorithm includes user input for the annual salary and performance rating. **(10 marks)**

c) Suggest possible datatypes for all your variables in the algorithm above **(4 marks)**

Question 3

For each of the following postfix expressions, draw the **syntax tree** that represents the structure of the expression**.** **(20 marks)**

i) a b c d + * e * + f + g +

ii) a b c * d e f * + / - g +

iii) a b c d e / f / - * g / +

iv) a b * c / d e + f * - g +

Question 4

a) A declarative programming language snippet below is used to represent knowledge about hardware devices, their types, locations, and statuses in an IT department.

```
01 device(printer1).
02 device(scanner1).
03 device(laptop1).
04 type(printer1, printer).
05 type(scanner1, scanner).
06 type(laptop1, laptop).
07 location(printer1, room101).
```

08 location(scanner1, room102).

09 location(laptop1, room103).

10 status(printer1, operational).

11 status(scanner1, under_maintenance).

12 status(laptop1, operational).

The clauses have the following meaning:

01: printer1 is a device.

04: printer1 is a printer.

07: printer1 is located in room101.

10: printer1 is operational.

i) Add a fact to represent that desktop1 is located in room104 and is operational. **(4 marks)**

ii) Write the result returned by the goal status (x, operational). **(3 marks)**

iii) Define a rule: A device D is critical if it is operational and located in room101. **(3 marks)**

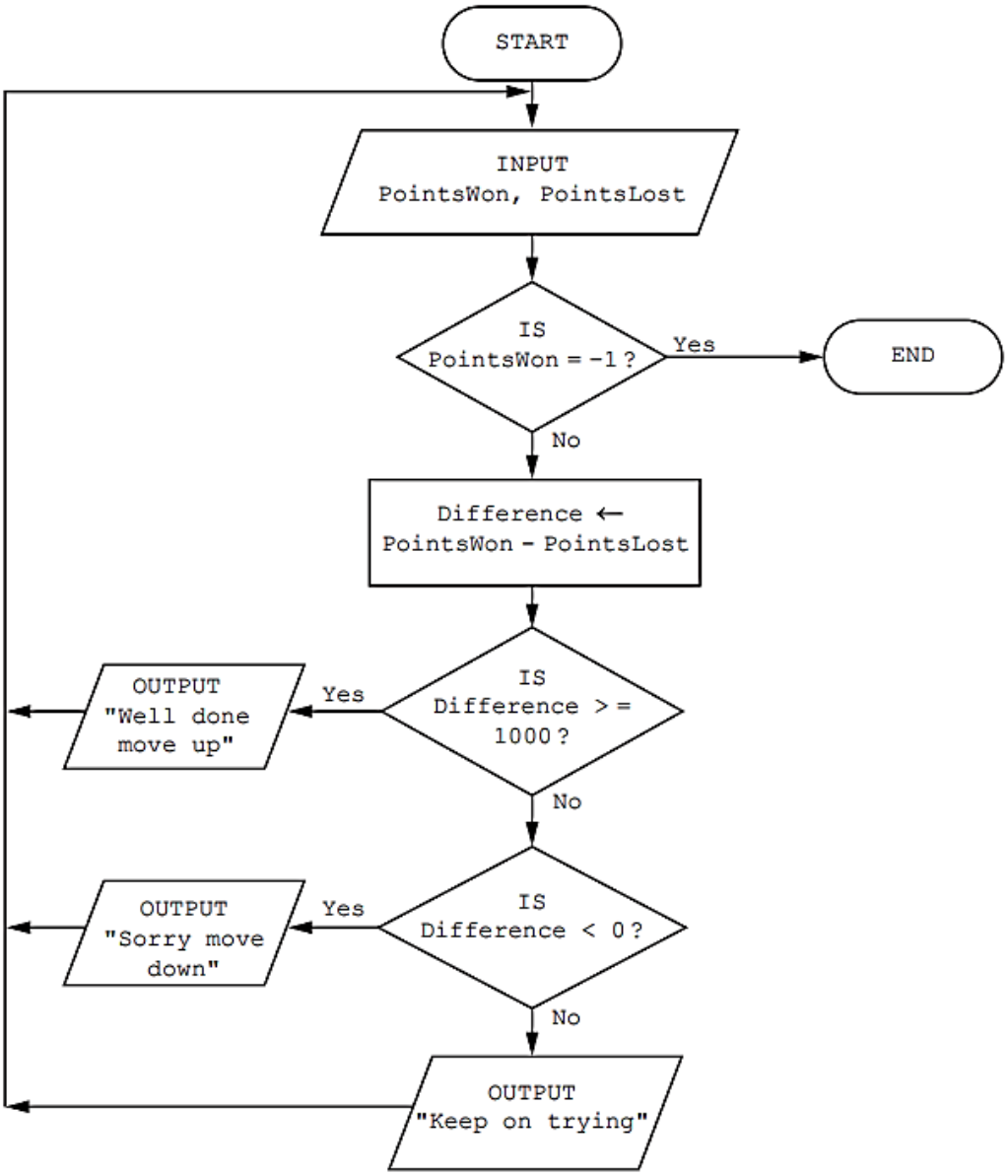
iv) Define a goal to find all devices that are under maintenance. **(3 marks)**

b) Differentiate between low level and high-level programming languages **(4 marks)**

c) Give any three general rules governing naming of variables **(3 marks)**

Question 5

This flowchart inputs the points won and the points lost when playing a game. The difference between the points won and lost is calculated and depending on the result the player can: move up to the next level, stay at the same level, or move down to the previous level. The flowchart finishes when the input for points won is –1.



a) Complete a trace table for this set of input data**:** **(12 marks)**

5000, 4474, 6055, 2000, 7900, 9800, 3000, 2150, –1, 6700, 7615

PointsWon	PointsLost	Difference	OUTPUT

b) The flowchart needs to be changed. When the difference is more than 5000 the output message is ‘Fantastic leap up two levels’.
Describe the changes that will need to be made to the flowchart. **(8 marks)**

Question 6

a) Write an algorithm to reverse a string provided by the user. The algorithm should handle the string input and output the reversed string **(10 marks)**

b) Write an algorithm to find the **sum of the largest two numbers** from a set of **five input numbers** provided by the user. The algorithm should handle the input and output the sum of the largest two numbers. **(10 marks)**