Section A	Short Answer Questions	5 marks each

Answer 11 of the 12 questions.

Question 1

(a) Define the term embedded system.

(b) Explain the main difference between analogue and digital signals.

1. Analogue signals -
2. Digital signals

Question 2

A computer system deals with binary values, when you press a button on the keyboard, for example the letter B, that letter is converted to a binary value so the CPU can understand the input. All the numbers, characters and text inputs on a keyboard are converted to a unique binary value that the CPU can understand.

(i) Convert the decimal value 34 to its binary value.

(ii) Convert the binary value 1111000 back into its decimal value.

Question 3

(a) Explain the difference between RAM and ROM.

RAM
ROM

(b) In the context of CPU architecture, explain the term ‘core’.

Question 4

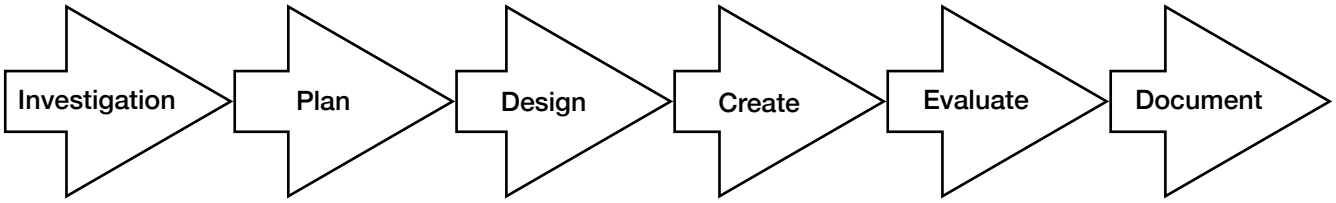


Figure 4

Figure 4 identifies some of the main stages of a software development design process. Describe briefly what happens at the following stages of the design process.

(a) Investigation stage

(b) Design stage

Question 5

The 7 Principles of Universal Design were developed in 1997 by a working group of architects, product designers, engineers and environmental design researchers. Their aim was to develop a design process for creating products that are accessible to people with a wide range of abilities, disabilities, and other characteristics

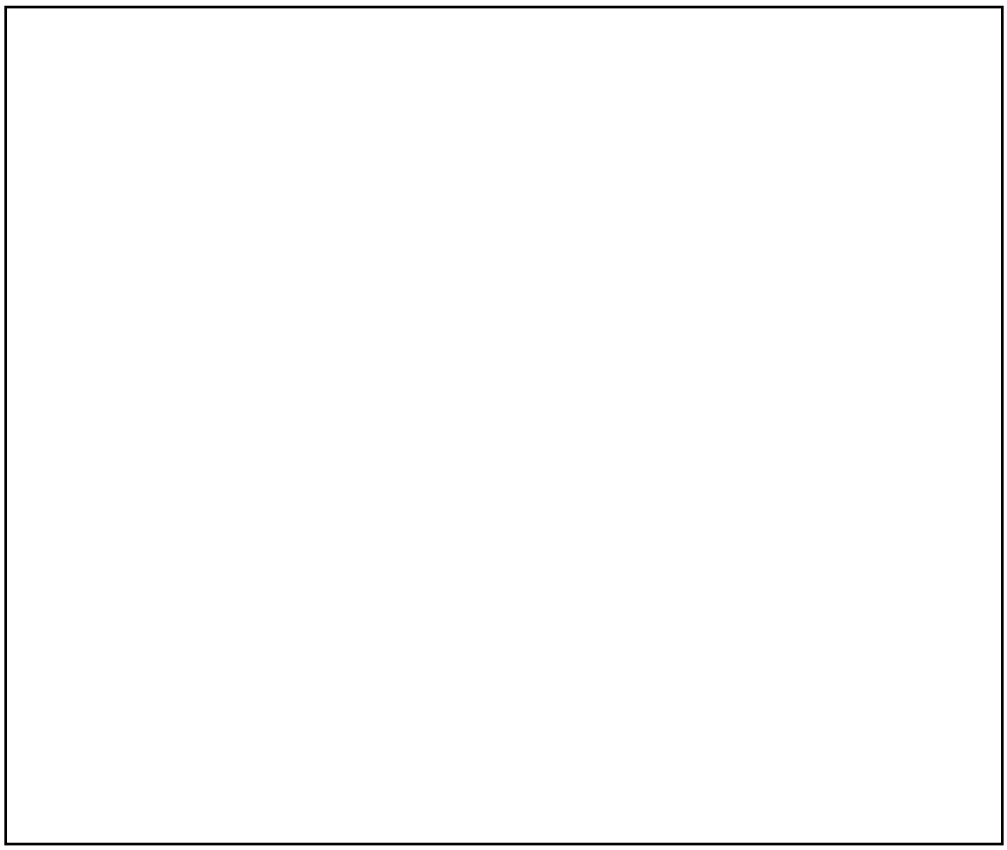
(a) Identify two different Principles of Universal Design and explain how they have been applied to a product, either software or hardware. (3 marks)

(b) Explain, with an example, how have the Principles of Universal Design have played a role in the development of adaptive technology that can play a role in the lives of people with special needs. (2 marks)

Question 6

Most general purpose computers share a common architecture that is named after John von Neumann.

a) **Draw** a diagram of the basic von Neumann computer system architecture, labelling the **CPU, ALU, Control Unit, bus, memory, input and output devices.**



b**)** What is the purpose of the bus system in von Neumann architecture?

Question 7

(a) Registers are small amounts of high-speed memory contained within the CPU. They are used by the processor to store small amounts of data that are needed during processing

(i) Name two other components that make up the structure of a CPU. (2 marks)

(ii) Explain the role of each of the components you identified in part (i) (3 marks)

Question 8

The data set below shows the raw data collected from the result of a 100m school race.
.

Surname	Gender	Age	Time
Murphy	M	17	13,12
Ogene	M	16	12.14
Ogene	M	16	12.14
Mc Intyre	F.	17	12.87
Lopez	F	-18	14.01
	F	17	1 329
McCarthy	M	77	13.65
Ó Brádaigh	f	16	13.09

Identify three problems with the dataset

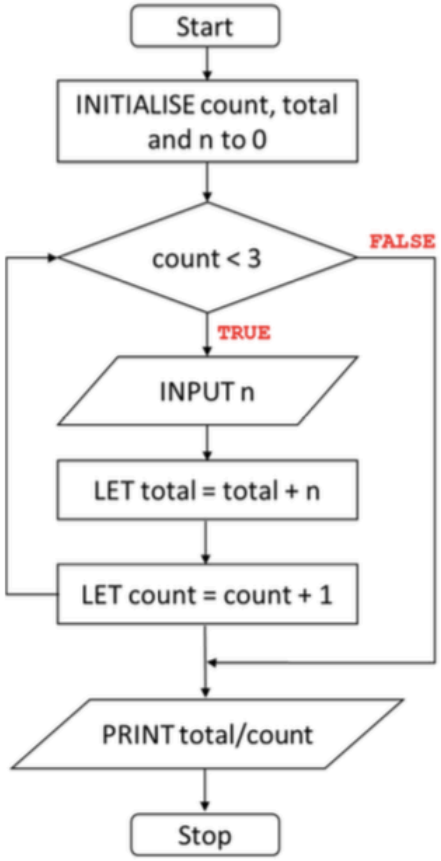
Question 9

What is the output of the following piece of Python code?

```
1  x = 3
2  print("x is", x)
3
4  y = x
5  x = x+4
6  print(x, y)
7
8  x = y*2
9  print(x, 2**y)
10
11 y = x-y-1
12 print("y is y")
```

Question 10

The flowchart in **Figure 1** is a representation of an algorithm.



(a) Using inputs of 7, 3 and 8 for n, complete the trace table showing the execution of the algorithm. (4 marks) (-1 mark for each incorrect value)

n	total	count
0	0	0
7		
3		
8		

(b) What does the output of the algorithm display (1 mark)

Question 11

The **Python** programming language has a variety of **inbuilt data types**. Give one example of each of the following data types:

Data Type	Example
Boolean	
Integer	
Float	

Question 12

The World wide web (WWW) and the network infrastructure that supports it allow for seamless transmission of data such as web pages, voice applications and stream in services. This is all possible due to the protocols that it uses.

a. When referring to **World Wide Web Infrastructure**, what is meant by the term **protocol**?

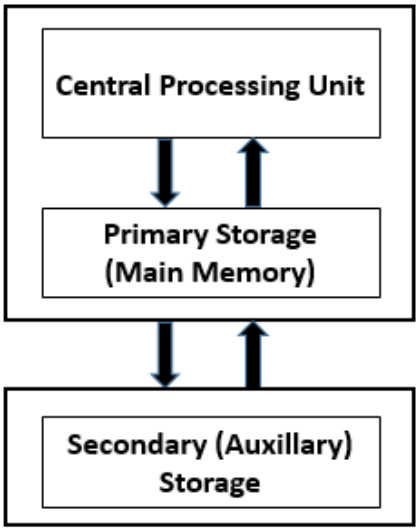
b. State the **name and purpose** of **TWO** such protocols

Section B	Long Questions	30 marks each Marks

Attempt both questions

Question 13

This diagram depicts a high-level view of some of the main components of a computer system.



(i) What is the purpose of the Central Processing Unit? (3 marks)

To process data

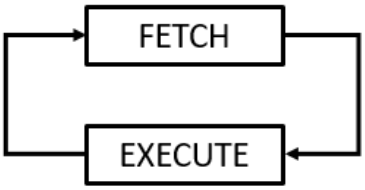
(ii) List **two** types of primary storage. (4 marks)

(iii) List **two** types of secondary storage. (4 marks)

(iv) State **two** key differences between primary and secondary storage. (5 marks)

(b) Explain the cycle of operations that are carried out as instructions are fetched, decoded and executed from a computer's memory.

Your explanation should refer to the role of registers.
(9 marks)



(c) List **two** different factors which affect the processing speed of a computer? (5 marks)

Question 14

Iteration is an important part of the software design process.

(A) (i) What is meant by an iterative design process. (3 marks)

(ii) Explain the advantages of implementing an iterative design process in software development.

(iii) Name one other design process you have studied and explain how it is different to an iterative approach. (5 marks)

(b) Evaluation is one of the key steps in the software development process. This step involves detailed testing of the software. There are a number of different types of testing used on the software depending on the stage of development.

Explain in **detail** the difference between functional testing and systematic testing. In your answer clearly identify what kind of testers would be involved in each type of testing and what part of the software is being tested.
(7 marks)

(c) The development of appropriate test data is an essential part of a test plan. Appropriate test data will allow testers to identify any issues with flow control, if loops and decisions are performing correctly and if the correct output is given for the relevant input.

```
1  weight = int(input());
2  height = float(input());
3
4  bmi = weight/float(height*height);
5
6  if bmi < 18.5:
7      print('Underweight')
8  if bmi>=18.5 and x<25:
9      print("Normal")
10 if bmi >= 25 and bmi < 30:
11     print('Overweight')
12 if bmi >= 30:
13     print('Obesity')
```

Fig 3

Fig 3 shows a simple piece of software used to determine the BMI of a user. Give 5 pieces of test data that could be used to determine the functionality of this program. As part of your test data identify what the actual output of the program would be, if any and what you would expect the output to be. (7 marks) (Any valid test cases)

Input	Actual output	Expected Output	Pass / Fail

(ii) From your test data, do you think you could improve the software and if not why not? (3 marks)

5th Year Christmas Examination, 2022

Computer Science

Sections A & B

Higher Level

Time: 1 hour

CANDIDATE DETAILS	
NAME	

SECTION	MARK
A	
B	
C	
TOTAL	