St Edward's College Malta
Mid-Year Examinations   February 2020

Year 13   **Computing HL**   **Time: 2 hours**
                   Paper 1

Name and Surname

Instructions to Students:

1. Do not open this examination paper until instructed to do so.
2. Write your name and surname on this page.
3. Read all instructions and questions carefully.
4. Answer ALL questions.
5. Diagrams must be drawn in pencil.
6. Leave the last 10 minutes for revision of paper.

For teacher's use only

| Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Obtained																
Allotted	4	2	2	2	2	3	2	2	3	3	15	15	15	15	15	100

Section A

1. Construct a **truth table** for the Boolean expression: (A or B) and (not C or B).   [4]

2. Outline the use of a **failover** system.   [2]

3. Describe the function of the **control unit** (CU) in the **central processing unit** (CPU).   [2]

4. Outline the reason why **recursive** solutions can be memory intensive.   [2]

5. Identify two reasons for releasing a software update.   [2]

6. Consider the following algorithm.
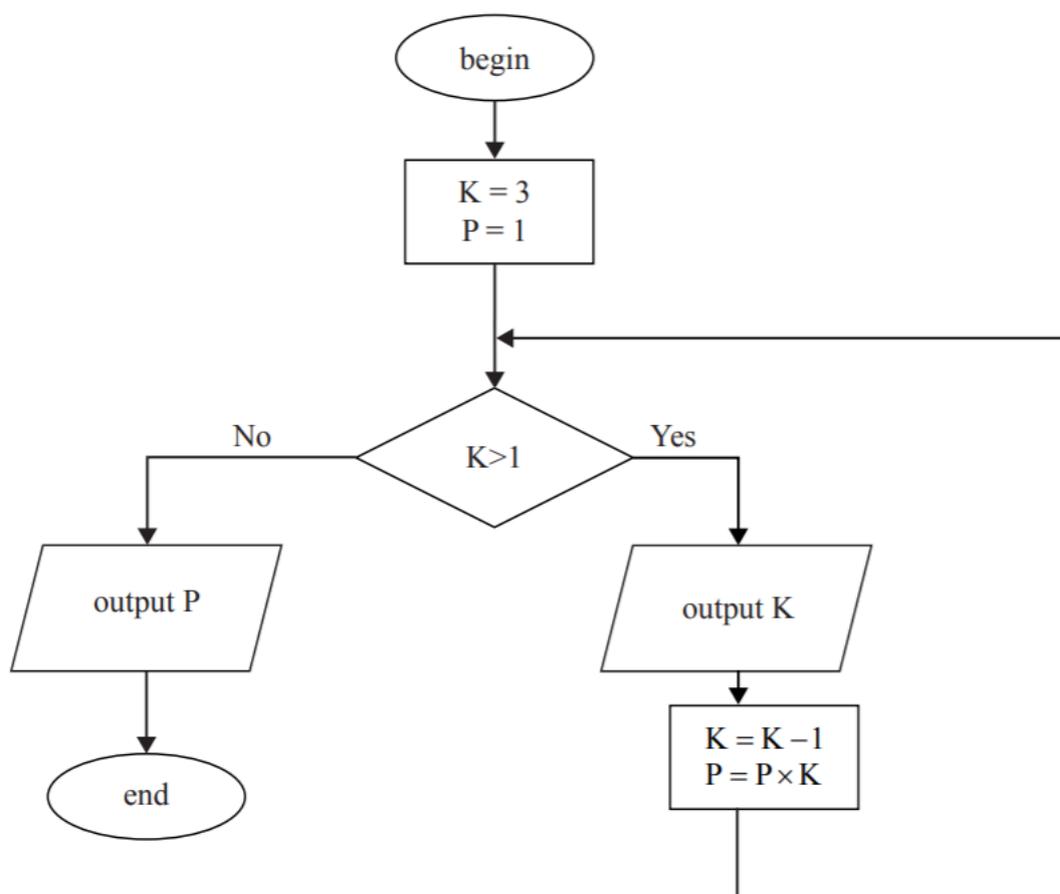
       Trace the algorithm and show the outputs that will be produced.   [3]

7. Explain what is meant by **beta testing**.   [2]

8. Identify **two** key features of a **peer-to-peer** (P2P) network.   [2]

9. Define the term **protocol** and outline why they are necessary.   [3]

10. Describe how a **GPS system** can identify the position of a person.   [3]

Section B

11. A large company has taken over another business. This takeover has required various changes to be made. One of the changes requires data migration.

    a. Define the term **data migration**. [1]

    b. Describe **two** problems, concerning data migration, which the company may have to overcome. [4]

    c. Other than data migration, describe **two** aspects of **change management** that may arise from this takeover. [4]

The company produces industrial chemicals. One of the chemical processes is represented by the following logic diagram.
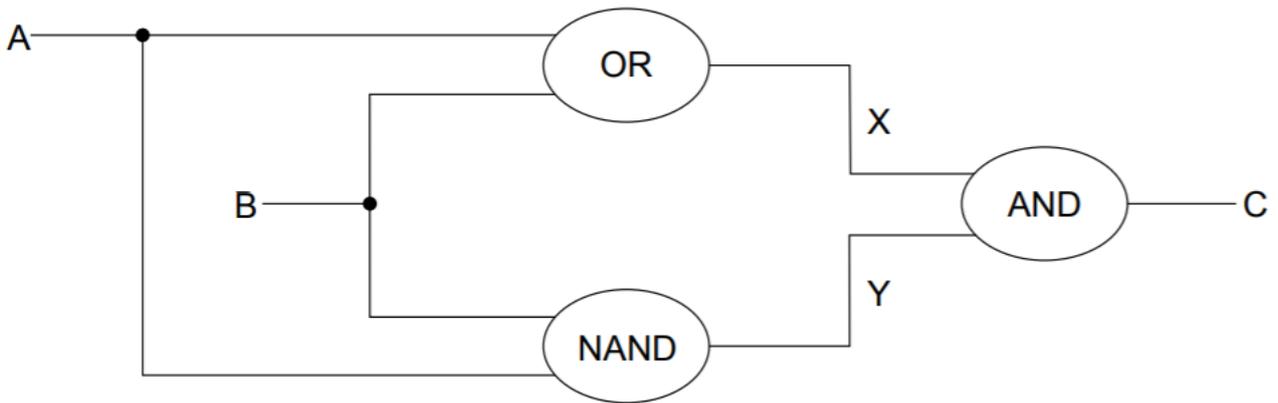
    d. Construct the **truth table** corresponding to this diagram. [3]

    e. Identify the **single** logic gate that is equivalent to this diagram. [1]

    f. Outline how truth tables can be used to test that any two logic diagrams are equivalent.

    [2]

12. A college has a high-speed network. The network is accessible to all students and staff through their personal accounts.

    The network may be accessed by using desktop computers available in the college. When in the college, users can also use personal laptops to connect wirelessly or dock with an Ethernet cable. When not in the college, users can connect via a virtual private network (VPN) over the internet.

a. In the given context, distinguish between **Ethernet** and **wireless** in terms of reliability of transmission. [4]

b. Describe **two** features of a **VPN** that make it secure. [4]

c. State **one** technology that is necessary for a VPN. [1]

The college is devising a policy for the use of its IT resources and services. They are considering prohibiting the use of external services such as cloud storage and blogs.

d. In relation to the specific activities that may be carried out by students, discuss **two** advantages and **two** disadvantages of the use of external services. [6]

13. In a small airport, the details of all flights due to arrive on a particular day are held in a collection, *FLIGHTS*. Each object in the collection contains the following information:

ID: unique flight number

PLACE: where the plane is coming from

DUE: the time it is scheduled to arrive

EXPECTED: the time it is expected to arrive (only if it is early or if it is delayed)

ARRIVED: the time of actual arrival.

EXPECTED and *ARRIVED* are blank at the beginning of the day and the collection is sorted in order of *DUE*.

A screen in the airport can display information on 20 planes at a time, which are held in a linked list.

a. Describe the features of a linked list of 20 planes that have the above information.[3]

All times are stored in the collection as the number of minutes since midnight. However they are displayed on the screen in 24-hour format (for example, 10:58 is stored in the collection as 658).

b. Construct an algorithm to convert the times held in the collection into hours and minutes needed for the 24-hour format displayed on the screen. [3]

If a plane arrived more than 30 minutes ago it is removed from the linked list and the next one in the collection is added to the end of the list.

c. With the aid of a **diagram**, explain how a plane which arrived more than 30 minutes ago could be removed from the linked list. [4]

d. For the application described above, **compare** the use of a **linked list** with the use of a **queue** of objects. [5]

14. An automated security system monitors a prison.

a. Suggest the **sensors** that could be used to detect any person crossing the perimeter.
[2]

A team of security guards patrols the perimeter of the prison at night. The guards each carry a device incorporating a GPS that links to the prison's security system.

b. Outline a suitable **output** that would notify a guard that a prisoner has escaped. [2]

The guards' GPS devices transmit information to the security system.

c. Suggest the most suitable method for the transmission

i. between the perimeter's sensors and the security system; [1]

ii. between the security system and the guards' devices. [1]

d. State one method of network security that could be used when transmitting the GPS information. [1]

e. Outline how this GPS information may be used once transmitted to the security system.
[2]

There are other situations where people may be required to carry GPS devices.

f. Discuss the **ethical** implications of insisting people carry GPS devices. [6]

15. A laptop computer supplements its primary memory by making use of virtual memory.

a. Outline the use of **paging** in relation to **virtual memory**. [2]

The laptop has 1GB of random access memory (RAM) and a single processor. The laptop is using one of the latest operating systems to run multimedia gaming programs.

b. Explain the **limitations** and **consequences** of using the laptop for this purpose. [3]

One of the laptop's game applications stores the data relating to the different actions of one of its characters in a **stack**.

c. Suggest one reason why the character's actions might be stored in a stack.   [2]

At specific moments during the game this data is read from the **stack** (S) into a **queue** (Q).

d. Using appropriate access methods for stacks and queues, construct an algorithm that reads the data from the stack and enters it into the queue. You should assume that the queue structure exists and that both structures are of a fixed size.   [6]

e. Outline one advantage of making the queue **dynamic**.   [2]