GCSE – NEW

3500U10-1

S19-3500U10-1

COMPUTER SCIENCE
Unit 1: Understanding Computer Science

MONDAY, 13 MAY 2019 – MORNING

1 hour 45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	4	
2.	12	
3.	4	
4.	9	
5.	6	
6.	5	
7.	13	
8.	13	
9.	4	
10.	12	
11	6	
12	12	
Total	100	

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

If you run out of space, use the continuation page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

The total number of marks is 100.

Some questions will require you to draw on your knowledge from multiple areas of your course of study.

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*Answer **all** questions.*

1. The diagram shows the routing cost between each node for data transmitted on a certain network.

Complete the table, indicating the lowest cost routes from node **D** to each destination. One of the rows has been completed for you. [4]

Destination	Lowest Cost	Route
A		
B		
C	4	**D > C**

2. The computer systems used at a school are starting to run slowly. The school is considering replacing their computers with one of the following:

Computer 1	Computer 2
• 5 GHz Dual-core 4MB cache • 4 GB RAM • 4 TB HDD, 7200 rpm • DVD/RW • Bluetooth mouse • Bluetooth keyboard	• 2.5 GHz Quad-core 8MB cache • 8 GB RAM • 128 GB SSD • Blu-ray • USB mouse • USB keyboard

(a) Compare the CPU performance of the **two** computers in terms of cache size, clock speed and number of cores. [6]

Cache size:

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Clock speed:

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Number of cores:

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Turn over.

(b) Compare the secondary storage devices used in the **two** computers. [6]

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(3500U10-1) **Turn over.**

3. *(a)* State the logical operator that has been used to produce the output in the following truth table. [1]

Input		Output
A	**B**	**C**
0	0	0
1	0	1
0	1	1
1	1	0

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(b) State the logical operator that has been used to produce the output in the following truth table. [1]

Input		Output
A	**B**	**C**
0	0	0
1	0	0
0	1	0
1	1	1

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(c) **Tick** (✓) the correct boxes below to show the Boolean expression that represents the function described by each truth table.

(i)

[1]

Input		Output
A	**B**	**C**
0	0	0
1	0	1
0	1	0
1	1	0

$C = A.B$ 1 ☐

$C = \overline{A + B}$ 2 ☐

$C = A.\overline{B}$ 3 ☐

$C = A + B$ 4 ☐

(ii)

[1]

Input		Output
A	**B**	**C**
0	0	1
1	0	0
0	1	0
1	1	0

$C = A.B$ 1 ☐

$C = \overline{A} + B$ 2 ☐

$C = A + B$ 3 ☐

$C = \overline{A.B}$ 4 ☐

4. Protocols provide an agreed set of rules to allow networked devices to communicate.

(a) **Tick** (✓) the boxes to match the protocol with the correct description. [3]

DESCRIPTION	PROTOCOL			
	Ethernet	IMAP	SMTP	TCP
The protocol that allows packets to be sent and received between computer systems.	1	2	3	4
A protocol that stores email messages on a mail server.	5	6	7	8
The protocol used to deliver email from the sender to an email server.	9	10	11	12

(b) Describe the network layer and physical layer in the TCP/IP 5-layer model for data transmission: [4]

Network layer: ....

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Physical layer: ....

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(c) Identify **one** protocol from question **4***(a)* used in each of the following layers in the TCP/IP 5-layer model for data transmission.

Application Layer: .... [1]

Transport Layer: .... [1]

5. An example of an Integrated Development Environment (IDE) is shown. An IDE is a software application that provides programmers with facilities to develop software.

```
Default.aspx  App_Code/RssCacheDependency.cs  Default.aspx.cs          ▼ ✕

RssCacheDependency                              CheckDependencyCallback(object sender)

   28      public XmlDocument RetrieveRSS(string URL)
   29      {
   30          XmlDocument retVal = XmlDocument();
∿  31          retVal.Load(URL);
   Thread(s) at Location:    eturn retVal;
      [9988] <No Name>
   34
   35      public void CheckDependencyCallback (object sender)
   36      {
   37          RssCacheDependency CacheDepends = sender as RssCacheDependency;
   38          XmlDocument NewRSS = RetrieveRSS(RSSUrl);
●  39          if (NewRSS.OuterXml != RSS.OuterXml)
   40          {
   41              CacheDepends.NotifyDependencyChanged(CacheDepends,EventArgs.Empty);
   42          }
⇨  43      }
   44
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Threads                                    ▼ ⇲ ✕  │ Output                        ▼ ⇲ ✕
       ID    Category        Name        Location       Suspen │ 'WebDev.WebServer.EXE' (Manage
       7852  Main Thread    Main Thread              0         │ 'WebDev.WebServer.EXE' (Manage
       4176  Worker Thread  <No Name>                0         │ 'WebDev.WebServer.EXE' (Manage
       11164 Worker Thread  Worker Thread            0         │ 'WebDev.WebServer.EXE' (Manage
  ⇨    3372  Worker Thread  RSSCache     RssCacheDependency.Ch 0 │ 'WebDev.WebServer.EXE' (Manage
       10332 Worker Thread  <No Name>                0         │ 'WebDev.WebServer.EXE' (Manage
       9988  Worker Thread  <No Name>    RssCacheDependency.Re 0 │ 'WebDev.WebServer.EXE' (Manage
       4696  Worker Thread  <No Name>                0         │ The thread 0x172c has exited w
                                                               │ The thread '<No Name>' (0x233c
                                                               │ The thread '<No Name>' (0x233c

 Error List  Find Results 1  Locals  Watch 1  Threads          │  Output  Call Stack  Immediate ...
```

Identify and describe **three** facilities provided by this IDE. [6]

Facility 1: ....

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Facility 2: ....

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Facility 3: ....

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6. Clearly showing each step, simplify the following Boolean expressions using Boolean algebra and identities:

(a) $P.(0 + P)$ [1]

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(b) $Q.(Q + P) + P.(Q + P)$ [4]

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Turn over.

7. *(a)* Complete the table, converting between denary and hexadecimal numbers. [2]

Denary	Hexadecimal
123_{10}	$7B_{16}$
	29_{16}
253_{10}	

(b) Complete the table to calculate the binary addition of 18_{10} to 89_{10} using an 8-bit register. [4]

Denary Equivalent	128	64	32	16	8	4	2	1
18_{10}								
89_{10}								
Carry								
Answer								

(c) Use a suitable example of binary addition to demonstrate the concept of overflow. [3]

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(d) Perform arithmetic shifts and state the effect of each of these operations.

(i) Arithmetic shift left by **one** place on 01111001_2. [2]

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(ii) Arithmetic shift right by **two** places on 01100100_2. [2]

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8. Graphics, sound and text are all stored using a computer system.

   (a) Explain how the following are stored using a computer system.

      (i) A graphic. [3]

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      (ii) An analogue sound wave. [3]

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      (iii) Text. [2]

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(b) Lossy and lossless are two types of data compression used to compress digital graphics.

A certain method uses the following compression ratios:

Lossy	10:1
Lossless	10:9

(i) Calculate the resulting file size using each compression type for a 200 KB image.

[2]

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Lossy file size: .... **Lossless file size:** ....

(ii) Explain why one of these compression types is unsuitable for a text document. [3]

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9. Explain the purpose and typical contents of an acceptable network use policy. [4]

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10. Computer systems are vulnerable to cyberattack.

(a) Describe the following forms of cyberattack:

(i) Worms. [2]

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(ii) Spyware. [2]

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(iii) Trojans. [2]

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(b) Describe the following **three** methods of identifying vulnerabilities.

(i) Footprinting: [2]

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(ii) Ethical hacking: [2]

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(iii) Penetration testing: [2]

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11. Describe the functionality of **three** utility software tools.   [6]

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12. Human-computer Interaction is dependent upon an interface.

Discuss the advantages and disadvantages of different types of interface. [12]

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END OF PAPER

For continuation only.

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