Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners’ meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the March 2018 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.
Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

<table>
<thead>
<tr>
<th>GENERIC MARKING PRINCIPLE 1:</th>
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<tbody>
<tr>
<td>Marks must be awarded in line with:</td>
</tr>
<tr>
<td>• the specific content of the mark scheme or the generic level descriptors for the question</td>
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<tr>
<td>• the specific skills defined in the mark scheme or in the generic level descriptors for the question</td>
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<tr>
<td>• the standard of response required by a candidate as exemplified by the standardisation scripts.</td>
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<thead>
<tr>
<th>GENERIC MARKING PRINCIPLE 2:</th>
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<tr>
<td>Marks awarded are always <strong>whole marks</strong> (not half marks, or other fractions).</td>
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<thead>
<tr>
<th>GENERIC MARKING PRINCIPLE 3:</th>
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<tr>
<td>Marks must be awarded <strong>positively</strong>:</td>
</tr>
<tr>
<td>• marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate</td>
</tr>
<tr>
<td>• marks are awarded when candidates clearly demonstrate what they know and can do</td>
</tr>
<tr>
<td>• marks are not deducted for errors</td>
</tr>
<tr>
<td>• marks are not deducted for omissions</td>
</tr>
<tr>
<td>• answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.</td>
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</tbody>
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<table>
<thead>
<tr>
<th>GENERIC MARKING PRINCIPLE 4:</th>
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<tbody>
<tr>
<td>Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.</td>
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<thead>
<tr>
<th>GENERIC MARKING PRINCIPLE 5:</th>
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<tbody>
<tr>
<td>Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).</td>
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<table>
<thead>
<tr>
<th>GENERIC MARKING PRINCIPLE 6:</th>
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<tbody>
<tr>
<td>Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.</td>
</tr>
<tr>
<td>Question</td>
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<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Marks</th>
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<tbody>
<tr>
<td>2</td>
<td><strong>Eight from:</strong>&lt;br&gt;Bandwidth requirements are higher to allow more detail in video images&lt;br&gt;Video-conferencing requires higher resolution video because there are often several people on screen at once&lt;br&gt;Need to see facial features/body expressions of participants clearly&lt;br&gt;One person to another (when video-conferencing) does not require high resolutions&lt;br&gt;High bandwidth (of 2–4 Mbps) would deliver an (H720p) high definition image for multiple participants&lt;br&gt;Low bandwidth (of 512 kbps) would be sufficient for one-to-one video-conferencing&lt;br&gt;Low bandwidth does not allow high definition images so would not be able to properly see the faces of multiple participants&lt;br&gt;High bandwidth would allow higher frame rates/30fps for smooth motion&lt;br&gt;Limited/low bandwidth requires trade-off between resolution and frame rate&lt;br&gt;Resolution priority for displaying slideshows/documents in detail&lt;br&gt;Motion priority for displaying video presentations.</td>
<td>8</td>
</tr>
</tbody>
</table>

*Max 6 for all positives or all negatives.*

*1 mark available for a reasoned conclusion/opinion.*
### Question 3(a)

**Answer:**

*Two from:*

- Each packet takes a different route through the network.
- Each router 'decides' which router to send it onto depending on other network traffic e.g. router A will send some packets to router C and some to D.
- If next router is busy/unavailable.
- If a packet is mis-sent/corrupt en route then re-transmission is requested from originating router.
- Time taken along different routes is not the same.
- Arriving at different times at network H.

**Marks:** 2

### Question 3(b)

**Answer:**

*Five from:*

- Each router has a stored lookup table of IP addresses/routes to the next router/network.
- Routing table is stored at control plane of router.
- Routing table used to choose next router/router to which to send packet.
- Static routes B to C to E to G are pre-programmed to show route to destination.
- Dynamic routing protocols build up a table of preferred routes between connected routers/networks.
- B to C to F to G if router E is inefficient/out of action/in heavy demand.
- If destination is unknown router B will send packet to next known router/C or D.
- If C/D router does not know destination to H then packet is sent onto next router/E or F.

**Marks:** 5

### Question 4(a)

**Answer:**

*One mark for both milestones:*

- A and C

**Marks:** 1

### Question 4(b)

**Answer:**

*Two from:*

- Critical path made up of activities F, I and J / A to C.
- C to D and D to E.
- Totalling $4 + 2 + 3 = 9$ months.

**Marks:** 2
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>4(c)</td>
<td>Five from:</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Max 2 from:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Activities on Y axis and labelled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time on X axis and labelled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Milestones identified</td>
<td></td>
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<tr>
<td></td>
<td>Max 3 marks from:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All activities shown correctly</td>
<td>3 marks</td>
</tr>
<tr>
<td></td>
<td>5 activities shown correctly</td>
<td>2 marks</td>
</tr>
<tr>
<td></td>
<td>4 activities shown correctly</td>
<td>1 mark</td>
</tr>
<tr>
<td></td>
<td>Less than 4 shown</td>
<td>0 marks</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Chart" /></td>
<td></td>
</tr>
<tr>
<td>5(a)</td>
<td>Four from:</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Filter/select the records in the data source on Invite? field</td>
<td></td>
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<tr>
<td></td>
<td>To remove the &quot;No&quot;/&quot;Yes&quot; are selected</td>
<td></td>
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<tr>
<td></td>
<td>Create new data source of &quot;Yes&quot; invites</td>
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<tr>
<td></td>
<td>Use new source file for the mail merge</td>
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<td></td>
<td>OR</td>
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<td></td>
<td>Use SKIPIF function in a merge field</td>
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<td></td>
<td>To skip “No” in Invite? field so that these are not used in the merge</td>
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<tr>
<td></td>
<td>Example code: { SKIPIF &quot;{ MERGEFIELD Invite? }&quot; = &quot;No&quot; }</td>
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<tr>
<td></td>
<td>Place the SKIPIF field at beginning of the template</td>
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<td></td>
<td>So the record is ignored early in process</td>
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<tr>
<td>Question</td>
<td>Answer</td>
<td>Marks</td>
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<tr>
<td>5(b)</td>
<td><em>Eight from:</em>&lt;br&gt;Replace the second &lt;&lt;City&gt;&gt; field/&lt;&lt;City&gt;&gt; field in body of letter&lt;br&gt;As this does not show correct city for meeting but repeats the address city&lt;br&gt;Insert variable field in place of this field to select meeting city based on Country field&lt;br&gt;Use a nested IF&lt;br&gt;Comparing Country with UK and with Egypt to select “London” as meeting city&lt;br&gt;If neither match then Hong Kong is selected as meeting city&lt;br&gt;Example code: <code>{ IF { MERGEFIELD Country} = “UK” “London” {IF { MERGEFIELD Country } = “Egypt” “London” “Hong Kong”} }</code>&lt;br&gt;Allow 1 mark for <code>{ IF { MERGEFIELD Country} = “UK” “London” }</code>&lt;br&gt;Allow 1 mark for <code>{IF { MERGEFIELD Country } = “Egypt” “London” “Hong Kong”} }</code></td>
<td>8</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
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| 6        | **Eight from:**

**Suitable code would be:**

```javascript
var AgeNow, CanApply;
AgeNow = Number(document.getElementById("AgeNow").value);
if (isNaN(AgeNow)) {
    CanApply = "Please enter your age in numbers.";
} else {
    CanApply = (AgeNow < 16)? "You are too young to apply for a licence.": "You are old enough to apply for a licence.";
}
```

*Mark points: 8 from:*

**Declare the variables, must be exact variable names as in Question:**

```javascript
var AgeNow, CanApply;
```

**Capture the input of the age:**

```javascript
AgeNow = Number();
```

**Use of correct capture code:**

```javascript
document.getElementById("AgeNow").value;
```

**Use of "isNaN" to check that the input is a number:**

```javascript
if (isNaN(AgeNow))
```

**Display error message if not a number:**

```javascript
CanApply = "Please enter your age in numbers.";
```

**Use of "if...else" to make decision:**

```javascript
} else {
```

**Use of comparison check:**

```javascript
CanApply = (AgeNow < 16)? "You are too young to apply for a licence.": "You are old enough to apply for a licence.";
```

**Appropriate display messages:** e.g. "You are too young to apply for a licence.": "You are old enough to apply for a licence.";

**Messages match comparison: i.e.:**

- < 16... too young; old enough
- >16.... old enough; too young
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| 7 | **Eight from e.g.:**  
Help physicians/doctors monitor and diagnose illness/disease  
Data transferred directly by head up display/to retina of doctor/ anaesthetist/ surgeon during medical procedures  
Less time spent on reading/tracking data  
Wearable systems (e.g. e-skin) on patients including sensors send data direct to doctors  
Enhance patient-doctor interaction  
Patients have more access to data  
Doctors can monitor remotely  
Assist in medical procedures/surgery  
Access to digital images during procedures/overlay of images onto procedure  
Remote guidance during procedures/emergency assistance  
Assist/allow patients to manage and control pain  
Implantable systems to control diabetes/blood pressure/food intake/activity  
Improve employment of personal fitness regimes  
Fitness bands to track activity/sleep patterns  
Educate patients in their health  
Patients can monitor own health and be aware of changes/conditions and make decisions themselves. | 8 |
| 8 | **Four from:**  
User/client may decide that the early version is all that is needed  
Developers can focus on developing parts of the system that they understand  
Instead of developing a whole system which might be beyond their comprehension  
Improvements/alterations/add-ons to the system can be created later  
First prototype is not discarded so materials/time are not wasted  
Throw-away prototypes may not work at all/be on paper only  
Can be used in interim until final system is complete. | 4 |
| 9(a) | **Two from:**  
*(PPP is)* Point to Point Protocol  
Used in (most) dial-up connections  
Has link monitoring capability/can log how many errors occur  
Can maintain multiple links and enable them to function as single link  
Provides authentication via password authentication protocol *(PAP)/challenge-handshake protocol (CHAP)*  
Requires a username/password to allow dial in to network. | 2 |
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<tbody>
<tr>
<td><strong>9(b)</strong></td>
<td><em>Eight from:</em> Can use multiple email clients simultaneously Allows use of same email system on mobile devices and PCs at same time Changes on one device are reflected on other devices connected at same time Provides multiple mail boxes Can create/use folders/mailboxes on server Can copy messages Email clients stay connected to server Email messages downloaded as and when they arrive at server Provides faster response time to emails to recipient compared to POP3 Allows access to sections of message/partial messages/partial fetch Messages with attachments can be retrieved without downloading the attachment Can stream content as it is being retrieved Message state information available Uses flags stored on server to check whether message has been read/replied to/deleted Can be seen across connected devices Server-side searches can be carried out Email client can search server for email messages using user-defined criteria.</td>
<td>8</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td>Marks</td>
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<tr>
<td>10</td>
<td>This question to be marked as a Level of Response.</td>
<td>8</td>
</tr>
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</table>

**Level 3 (7–8 marks)**
Candidates will evaluate in detail, giving both advantages and disadvantages of, the use of asymmetric and symmetric cryptography when encrypting data for electronic transmission between two persons. The information will be relevant, clear, organised and presented in a structured and coherent format. There will be a reasoned conclusion/opinion. Subject specific terminology will be used accurately and appropriately.

**Level 2 (4–6 marks)**
Candidates will explain the use, giving both an advantage and disadvantage, of asymmetric and symmetric cryptography when encrypting data for electronic transmission between two persons. For the most part, the information will be relevant and presented in a structured and coherent format. There may be a reasoned conclusion/opinion. Subject specific terminology will be used appropriately and for the most part correctly.

**Level 1 (1–3 marks)**
Candidates will describe, with at least one advantage/disadvantage of, the use of asymmetric and symmetric cryptography when encrypting data for electronic transmission between two persons. Answers may be in the form of a list. There will be little or no use of specialist terms.

**Level 0 (0 marks):** Response with no valid content.

*Answers may make reference to e.g.:*

**symmetric-key** cryptography:

**Advantages:**
- shares the same/related key with sender and receiver...
- process is relatively fast
- used on solid state drives to encrypt/decrypt data as it is written/read to/from disk.

**Disadvantages:**
- keys must be kept secret from others
- sharing keys between sender/recipient is a security issue
- if key is compromised both sender and recipient are at risk.
Question 10

**asymmetric key** cryptography (public key)

**Advantages:**
- uses different keys to encrypt and decrypt
- public key is known to all, but private key is known only to recipient
- only private key must be kept secret
- anyone can use public key to encrypt
- only recipient can decrypt
- keys are not shared
- so is very secure
- if private key compromised, only sender's data is at risk as any other data sent to others is encrypted with a different public key.

**Disadvantages:**
- process is relatively slow...
- so not suitable for e.g. hard disk encryption on-the-fly.

Question 11

**Five from:**

Much larger screens possible without perceived loss of picture quality
Resolution almost double that of standard high definition screen means greater detail in picture
Higher quality connectors/leads/HDMI cables required to carry signals from set-top boxes to TV and these cost more/more difficult to manufacture
New methods of delivering HD/UltraHD/4K/8K content are required as current broadcast systems/terrestrial/current satellite TV
Investment in infrastructure required
Increased use of internet/cable TV connections
New/updated (recording) systems required to process the MPEG4/H.265/VP9 data/signals
Requires faster processors/greater processing power in devices
Broadcasts cannot deliver/do not have the bandwidth required
Internet/network infrastructure has to be capable of providing high bandwidth connections to homes/businesses
Streaming of high definition TV requires greater bandwidth
High-speed/bandwidth internet is not universally available
Better home networking products/network configuration required to steam high definition TV
QoS settings in routers need to be configured to ensure smooth video.
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</table>
| 12       | Eight from:  
Banking is available at any time so financial transactions can occur at any time  
No issues with banks being closed/international time zones  
Financial transactions are carried out/confirmed more quickly than at branches/ATMs  
Accounts can be monitored/used at on different/mobile devices  
Transactions can be tracked  
Demand for access to technology/internet increased due to moves to online banking  
Increase in online banking has led to decrease in number of bank branches/personal customer service  
Online banking has led to reduction/removal of paper audit trails  
Online banking has led to increased security threats/issues as a result of phishing/scams.  

*Max 6 for all positives or all negatives.*  
1 mark available for a reasoned conclusion/opinion. | 8 |