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**INFORMATION TECHNOLOGY**

**9626/32**

Paper 3 Advanced Theory

**March 2018**

MARK SCHEME

Maximum Mark: 90

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**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.

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This document consists of **12** printed pages.

**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.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

the specific content of the mark scheme or the generic level descriptors for the question  
the specific skills defined in the mark scheme or in the generic level descriptors for the question  
the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

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  
marks are awarded when candidates clearly demonstrate what they know and can do  
marks are not deducted for errors  
marks are not deducted for omissions  
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.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

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).

**GENERIC MARKING PRINCIPLE 6:**

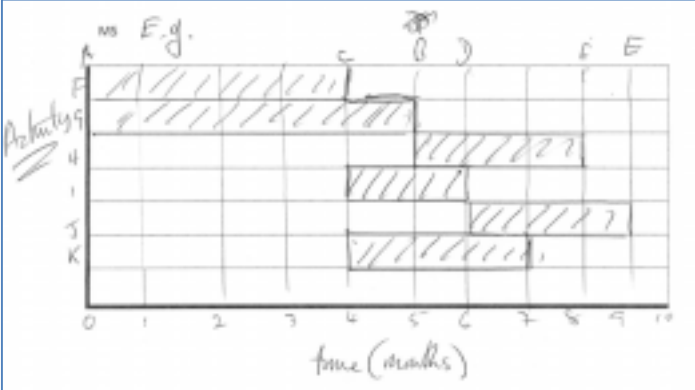
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1	<p><b>Four from:</b></p> <p>Can be saved/stored in a variety of formats so that the webpage can be viewed on all computer platforms</p> <p>Can be output from many applications so easy to produce</p> <p>Can be created from the pixel arrays in memory</p> <p>Can display vast range of colours depending on bits per pixel</p> <p>Can display subtle gradations of shades/colour/greyscales as it is made of pixels</p> <p>Best for photo-realism/continuous tones compared to vector images so images of advertised items appear more realistic</p> <p>Individual pixels can be modified to customise/edit the image so images of advertised items are more appealing/attractive</p> <p>Can translate easily to dot-format output for use with CRTs/printers</p> <p>Can be used in simple animations e.g. Animated gifs</p> <p>Can be compressed so that file size is reduced and loads faster.</p>	4

Question	Answer	Marks
2	<p><b>Eight from:</b></p> <p>Bandwidth requirements are higher to allow more detail in video images</p> <p>Video-conferencing requires higher resolution video because there are often several people on screen at once</p> <p>Need to see facial features/body expressions of participants clearly</p> <p>One person to another (when video-conferencing) does not require high resolutions</p> <p>High bandwidth (of 2–4 Mbps) would deliver an (H720p) high definition image for multiple participants</p> <p>Low bandwidth (of 512 kbps) would be sufficient for one-to-one video-conferencing</p> <p>Low bandwidth does not allow high definition images so would not be able to properly see the faces of multiple participants</p> <p>High bandwidth would allow higher frame rates/30fps for smooth motion</p> <p>Limited/low bandwidth requires trade-off between resolution and frame rate</p> <p>Resolution priority for displaying slideshows/documents in detail</p> <p>Motion priority for displaying video presentations.</p> <p><i>Max 6 for all positives or all negatives.</i></p> <p><i>1 mark available for a reasoned conclusion/opinion.</i></p>	8

Question	Answer	Marks
3(a)	<p><b>Two from:</b></p> <p>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.</p>	<b>2</b>
3(b)	<p><b>Five from:</b></p> <p>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.</p>	<b>5</b>

Question	Answer	Marks
4(a)	<p><b>One mark for both milestones:</b></p> <p>A and C</p>	<b>1</b>
4(b)	<p><b>Two from:</b></p> <p>Critical path made up of activities F, I and J / A to C            C to D and D to E            Totalling <math>4 + 2 + 3 = 9</math> months.</p>	<b>2</b>

Question	Answer	Marks
<p>4(c)</p>	<p><b>Five from:</b></p> <p><i>Max 2 from:</i>  <i>Activities on Y axis and labelled</i>  <i>Time on X axis and labelled</i>  <i>Milestones identified</i></p> <p><i>Max 3 marks from:</i>  <i>All activities shown correctly            3 marks</i>  <i>5 activities shown correctly            2 marks</i>  <i>4 activities shown correctly            1 mark</i>  <i>Less than 4 shown                      0 marks</i></p> 	<p><b>5</b></p>
<p>5(a)</p>	<p><b>Four from:</b></p> <p>Filter/select the records in the data source on Invite? field          To remove the “No” /”Yes” are selected          Create new data source of “Yes” invites          Use new source file for the mail merge.</p> <p>OR</p> <p>Use SKIPIF function in a merge field          To skip “No” in Invite? field so that these are not used in the merge          Example code: { SKIPIF "{ MERGEFIELD Invite? }" = "No" }          Place the SKIPIF field at beginning of the template          So the record is ignored early in process.</p>	<p><b>4</b></p>

Question	Answer	Marks
5(b)	<p><b><i>Eight from:</i></b></p> <p>Replace the second &lt;&lt;City&gt;&gt; field/&lt;&lt;City&gt;&gt; field in body of letter  As this does not show correct city for meeting but repeats the address city  Insert variable field in place of this field to select meeting city based on  Country field  Use a nested IF  Comparing Country with UK and with Egypt to select “London” as meeting  city  If neither match then Hong Kong is selected as meeting city</p> <p>Example code: { IF { MERGEFIELD Country } = “UK” “London” {IF {  MERGEFIELD Country } = “Egypt” “London” “Hong Kong” } }</p> <p><i>Allow 1 mark for { IF { MERGEFIELD Country } = “UK” “London”</i>  <i>Allow 1 mark for {IF { MERGEFIELD Country } = “Egypt” “London” “Hong  Kong” } }</i></p>	8

Question	Answer	Marks
6	<p><b>Eight from:</b></p> <p><i>Suitable code would be:</i></p> <pre>var AgeNow, CanApply;     AgeNow = Number(document.getElementById("AgeNow").value);     if (isNaN(AgeNow)) {         CanApply = "Please enter your age in numbers.";     } else {         CanApply = (AgeNow &lt; 16)? "You are too young to apply for a licence.": "You are old enough to apply for a licence.";</pre> <p><i>Mark points: 8 from:</i></p> <p><b>Declare the variables, must be exact variable names as in Question:</b> var AgeNow, CanApply;</p> <p><b>Capture the input of the age:</b> AgeNow=Number()</p> <p><b>Use of correct capture code:</b> document.getElementById("AgeNow").value;</p> <p><b>Use of "isNaN" to check that the input is a number:</b> if (isNaN(AgeNow))</p> <p><b>Display error message if not a number:</b> CanApply = "Please enter your age in numbers.";</p> <p><i>Use of "if...else" to make decision:</i> } else {</p> <p><b>Use of comparison check:</b> CanApply = (AgeNow &lt; 16)?</p> <p><b>Appropriate display messages:</b> e.g. "You are too young to apply for a licence.": "You are old enough to apply for a licence.";</p> <p><b>Messages match comparison: i.e.:</b> &lt; 16... too young; old enough &gt;16.... old enough; too young</p>	8

Question	Answer	Marks
7	<p><b>Eight from e.g.:</b></p> <p>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.</p>	8

Question	Answer	Marks
8	<p><b>Four from:</b></p> <p>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.</p>	4

Question	Answer	Marks
9(a)	<p><b>Two from:</b></p> <p>(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.</p>	2



Question	Answer	Marks
9(b)	<p><b><i>Eight from:</i></b></p> <ul style="list-style-type: none"><li>Can use multiple email clients simultaneously</li><li>Allows use of same email system on mobile devices and PCs at same time</li><li>Changes on one device are reflected on other devices connected at same time</li><li>Provides multiple mail boxes</li><li>Can create/use folders/mailboxes on server</li><li>Can copy messages</li><li>Email clients stay connected to server</li><li>Email messages downloaded as and when they arrive at server</li><li>Provides faster response time to emails to recipient compared to POP3</li><li>Allows access to sections of message/partial messages/partial fetch</li><li>Messages with attachments can be retrieved without downloading the attachment</li><li>Can stream content as it is being retrieved</li><li>Message state information available</li><li>Uses flags stored on server to check whether message has been read/replied to/deleted</li><li>Can be seen across connected devices</li><li>Server-side searches can be carried out</li><li>Email client can search server for email messages using user-defined criteria.</li></ul>	<b>8</b>

Question	Answer	Marks
10	<p>This question to be marked as a Level of Response.</p> <p><b>Level 3 (7–8 marks)</b> 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.</p> <p><b>Level 2 (4–6 marks)</b> 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.</p> <p><b>Level 1 (1–3 marks)</b> Candidates will describe, with a 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.</p> <p><b>Level 0 (0 marks):</b> Response with no valid content.</p> <p><b>Answers may make reference to e.g.:</b></p> <p><b>symmetric-key</b> cryptography:</p> <p><i>Advantages:</i> 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.</p> <p><i>Disadvantages:</i> ...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.</p>	8

Question	Answer	Marks
10	<p><b>asymmetric key</b> cryptography (public key)</p> <p><i>Advantages:</i>            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 senders data is at risk as any other data sent to others is encrypted with a different public key.</p> <p><i>Disadvantages:</i>            ...process is relatively slow...            ...so not suitable for e.g. hard disk encryption on-the-fly.</p>	

Question	Answer	Marks
11	<p><b>Five from:</b></p> <p>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 stream high definition TV            QoS settings in routers need to be configured to ensure smooth video.</p>	5

Question	Answer	Marks
12	<p><b><i>Eight from:</i></b></p> <p>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.</p> <p><i>Max 6 for all positives or all negatives.            1 mark available for a reasoned conclusion/opinion.</i></p>	8