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|  | |  |  | | --- | --- | | **Computer Science (9-1)**  Protocols Set 1 |  | | Please note that you may see slight differences between this paper and the original.  Candidates answer on the Question paper.  **OCR supplied materials:** Additional resources may be supplied with this paper.  **Other materials required:** •   Pencil •   Ruler (cm/mm) | **Duration:** Not set | |  | | |  |

## INSTRUCTIONS TO CANDIDATES

•   Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.  
•   Use black ink. HB pencil may be used for graphs and diagrams only.  
•   Answer **all** the questions, unless your teacher tells you otherwise.  
•   Read each question carefully. Make sure you know what you have to do before starting your answer.  
•   Where space is provided below the question, please write your answer there.  
•   You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number  
    and question number(s).

## INFORMATION FOR CANDIDATES

•   The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography   
    a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and  
    grammar and the use of specialist terminology* is assessed.  
•   The number of marks is given in brackets **[ ]** at the end of each question or part question.  
•   The total number of marks for this paper is **28**.  
•   The total number of marks may take into account some 'either/or' question choices.

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| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **1(a).** | For each of the scenarios below, identify the most appropriate protocol to be used and explain the function of the protocol.   1. A user wants to transfer a file directly from his computer to his friend’s computer.         **[2]**   1. A customer wants to securely log into her bank’s website to check her account balance.         **[2]** | |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **(b).** | Explain the difference between how the IMAP (Internet message access protocol) and SMTP (simple mail transfer protocol) protocols are used.            **[2]** | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **2.** | A house has computers in each room and a central router. Every room allows both Ethernet and WiFi connections to the router.  A user enters a uniform resource locator (URL) into a web browser on one of the computers in the house. A system is then used to find the IP address of the web server associated with the URL.   1. Name the system which matches URLs to IP addresses on the web.     **[1]**   1. The following statements describe what happens after the IP address has been found and returned to the user’s computer.  There are **five** missing statements in the table.  Write the letter of the missing statements from the table in the correct place to complete the description.  |  |  |  | | --- | --- | --- | | 1 | The request is put into packets | | | 2 |  |  | | 3 | The packets are sent across the network | | | 4 |  |  | | 5 |  |  | | 6 | If they have not arrived: | | | 7 | A timeout is sent to request the packets are resent | | | 8 | If they have arrived: | | | 9 |  |  | | 10 |  |  |    |  |  |  |  | | --- | --- | --- | --- | |  | **Letter** | **Statement** |  | |  | **A** | The server checks if all the packets have arrived |  | |  | **B** | The packets are put in order |  | |  | **C** | The request is processed by the web server |  | |  | **D** | The packets are received by the host server |  | |  | **E** | Each packet is given the address and a number |  |  |  | | --- | | **[5]** | | | |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **3.** | Bill needs to send a document across a network to Ben. Write an algorithm to show how packets are used to send the document, starting from when Bill clicks send (sending), and finishing when Ben reads the document (receiving).                          **[6]** | | |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **4(a).** | The owners of a large bakery have a Local Area Network (LAN) with a star topology. They order their supplies over the Internet. When data is transmitted from the bakery to the supplier, network protocols are used.  Define what is meant by a ‘network protocol’.      **[1]** | |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **(b).** | TCP/IP is a set of protocols based on layers.   1. With regards to network protocols, define what is meant by a ‘layer’.       **[1]**   1. Describe **one** advantage of using layers to construct network protocols.       **[2]** | | |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **5.** | A bank uses a local area network to connect all the computers in its head office.  Computers in the network can be identified using both IP addresses and MAC addresses.  Describe **two** differences between IP addresses and MAC addresses.                **[4]** | | |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | |  |  | | **6.** | When connecting computers into a network, the use of appropriate protocols are important.  Explain what is meant by a protocol.        **[2]** | | |

**END OF QUESTION paper**

# Mark scheme

|  |  |  |  |  |  |
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| **Question** | | | **Answer/Indicative content** | **Marks** | **Guidance** |
| 1 | a | i | 1 mark for protocol, 1 mark for description   * FTP / file transfer protocol * Uses a client-server model / sends from client to server / sends from server to client | 2 AO2 1b (2) | If protocol wrong, no mark for description                   **Examiner’s Comments**  Many candidates were able to identify the appropriate protocol of FTP. Few candidates were able to explain the function of this protocol. Common answers including redefining it as transferring a file, and not actually the function of it. |
|  |  | ii | 1 mark for protocol, 1 mark for description e.g.   * HTTPS / hyper text transfer protocol secure * Encrypts the connection/data / Uses SSL/secure socket layer | 2 AO2 1b (2) | If protocol wrong, no mark for description       **Examiner’s Comments**  This protocol was often identified correctly and many candidates were able to describe its function in encrypting the data to ensure its security. Some candidates gave a description of it showing a padlock on the browser, but this does not explain the function of the protocol. |
|  | b |  | 1 mark for IMAP, 1 mark for SMTP. IMAP   * Retrieves/accesses/downloads (a copy of an) e-mail * Allows synchronisation/management of account   SMTP:   * Sends/forwards/transmits e-mail | 2 AO1 1b (2) | Marks are for IMAP retrieving, SMTP sending. At this stage do not worry about where they are going.     Question does not refer to email, so response must in some way refer to email/message. Sends/receives data is not enough.          **Examiner’s Comments**  This question asked for the difference between the two protocols. Some candidates gave the similarities, or generic descriptions of each without actually identifying the difference. Many candidates described these as sending data without direct reference to actually what is being transferred e.g. emails. |
|  |  |  | **Total** | **6** |  |
| 2 |  | i | Domain Name Server / DNS. | 1 AO1 1a (1) | Allow Server/service/system      **Examiner’s Comments**  This question required an understanding of a Domain Name Server/System to convert URLs to IPs. Few candidates were able to identify this system, with many making guessing such as HTTP. Many candidates did not attempt to answer this question. |
|  |  | ii | 1 mark for each letter in the correct place 1 The request is put into packets 2 **Е** 3 The packets are sent across the network 4 **D** 5 **А** 6 If they have not arrived: 7   A timeout is sent to request the packets are resent 8 If they have arrived: 9   **В** 10  **С** | 5 AO1 1b (5) | **Examiner’s Comments**  This question required an understanding of how packets of data are sent across a network. Candidates were required to read through the statements and order them logically. The more able were able to identify the appropriate sequence. Less able candidates confused some of the statements, such as identifying the request as being processed before the packets were received. |
|  |  |  | **Total** | **6** |  |
| 3 |  |  | Sending;   * Bill's computer splits data into equal sizes packets (1) * Each packet is given the address of Ben's computer (1) * Each packet is given a number (1) * Each packet is given error checking data (1) * The packets are sent across the network (1)   Receiving;   * Ben's computer checks if all packets have been received? (1) * If No… * …Check again (1) * …Increment timer (1) * …If timer > max wait (1) * …Send timeout to Bill's computer (1) * If Yes… * …Reorder packets based on their number (1) * …Display the document (1) * …Send receipt confirmation (1) * …Each packet is checked for errors (1)… * … if corrupt a message is sent back to sender (1) | 6 | Answers must be a recognisable algorithm. Candidates can use a flow chart or any form of pseudocode.  Candidates can only be awarded a maximum of 4 marks for sending or receiving. |
|  |  |  | **Total** | **6** |  |
| 4 | a |  | * A network protocol defines rules for data transmission * A network protocol defines standards for data transmission | 1 | 1 mark only to be awarded for a correct definition. |
|  | b | i | * A division of network functionality | 1 | Candidate's responses may differ from the given answer but must represent conceptually the same thing.  e.g. “a layer is where jobs/processes are split up” would receive the mark. |
|  |  | ii | * It is self-contained (1)… * …it allows different developers to concentrate on one aspect of the network (1) * A layer can be taken out and edited without affecting other layers (1)… * …it promotes interoperability between vendors and systems (1) | 2 | 1 mark to be awarded for the correct identification and 1 for a valid description up to a maximum of 2 marks. |
|  |  |  | **Total** | **4** |  |
| 5 |  |  | * IP addresses can be changed / are allocated as needed * MAC addresses can't be changed / every device has a fixed MC address * IP(v4) addresses are 4 bytes long * MAC addresses are 6 bytes long * IP(v4) addresses are normally written in denary * MAC addresses are normally written in Hex * IP addresses are configured by software * MAC addresses are configured in hardware * IP addresses are used for routing across a WAN / internet * MAC addresses are only used within the LAN   [marks in pairs, maximum 2 pairs] | 4 | For bullets 3 and 4, accept answers where candidates refer to IPv6 being 16 bytes (128 bits). Award one mark if candidates state that IP addresses and MAC addresses are of different size. |
|  |  |  | **Total** | **4** |  |
| 6 |  |  | * An agreement / set of rules / standard * …for how computers should communicate / how data is sent/received/transmitted on a network * Example of what could be agreed in the protocol (e.g. speed / error checking / etc.) | 2 AO2 1b (2) | Do not award set of instructions for bullet 1            **Examiner’s Comments**  Most candidates were able to answer this question well, describing a protocol as a set of rules, although fewer added the context of networks as required by the question. Common misconceptions included descriptions such as a set of instructions, or steps, or an algorithm. |
|  |  |  | **Total** | **2** |  |