Computer Science (H046, H446)

Networks
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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

39/45

Candidate forename	Daniel	Candidate surname	

Centre number						Candidate number				

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 **45**.
- The total number of marks may take into account some 'either/or' question choices.

1(a) Describe how packet switching is used to transmit datafrom one computer to another computer on a network.

On the sender's computer, the data is broken down into smaller segments of data of equal size called packets. These packets contain a header, payload and trailer. The header contains information on the packet like its sequence number, flag set being used and time to live/hop limit. The payload contains the real data and trailer has checksum. The packets each have a port number and exit the sender's computer via various ports. This means the packets travel individually and may travel through different routers on the internet. The packets hop from router to router, at each router, it is decided what the best path to take for the packet is, and the router forwards the packet down that best route. On arrival at recipient computer, the computer waits for all packets to arrive before the packets are reordered using their sequence number and presented to the recipient. If packets are missing, retransmission is requested.

and port number remark

[5]

(b) Explain two advantages of using packet switching instead of circuit switching to send a message between two computer on a network.

1

packet switching uses many different routes for the packets to travel through. This means it is virtually impossible to intercept every single data packet making this method more secure

2

Since data packets travel through routes on the internet, this allows for longer distance communication whereas with circuit switching it is inefficient and unable to establish a direct connection half way across the world.

[4] (3)

2 Elegant Bags is a company that makes designer handbags. It has decided it wants to sell its products online.

Elegant Bags puts its website on its servers which are given a public IP address. It also purchases the domain name `elegantbagsonline.co.uk`.

Explain the automated process that takes place that allows customers to access the site when they enter the domain name into their browser.

When the domain name is entered into browser, the browser requests to a DNS server (at the lowest end of the DNS server hierarchy) which contains a list of domain names with their matching Internet Protocol (IP) addresses, to find the domain name that was entered. The DNS server searches for the domain name in its database, if it finds it, it takes the domain name's corresponding IP address and substitutes it into the user's browser, the IP address allows it for requesting the website's data via the web server the site is hosted on. If domain name is not found, the DNS server forwards the request to a larger DNS server until the domain name is found or doesn't exist. [3]

3 A coffee company has coffee shops located across the country. Each shop has its own Local Area Network (LAN). The company wants to connect the shops in a Wide Area Network (WAN).

Describe **one** piece of hardware that each shop will need to connect their LAN to the company's WAN.

A router, which forwards stores packets during communication and therefore links two networks together [2]

The new network will enable the company to roll out a mobile phone application that allows people to place their orders before they arrive at the shop. The company is deciding whether to use a menu-driven interface or a natural language interface.

4 A company releases an Internet connected fridge. Users can email messages to the fridge and it puts them on its display.

The fridge uses the TCP/IP stack.

Explain what is meant by the term 'TCP/IP stack'.

The ~~set~~ procedures of protocols and ~~rules~~ that are followed to allow for internet communication between devices. It consists of 4 layers each for a different purpose and encapsulates data, preparing data for transmission. These layers include from top to bottom: Application, transport, internet, and link layers

[3]

5 Anika's computer runs a multi-tasking operating system. She has access to a printer and a broadband internet connection through a wireless connection. The operating system uses scheduling algorithms such as first come first served and round-robin.

Anika uses an encrypted messaging program to communicate with her friends. The computer uses the TCP/IP stack.

(i) Explain what happens at the application layer of the TCP/IP stack when using this program.

The application layer is responsible for selecting what protocols are appropriate to use for data transmission, as well as displaying formatted data in the format of the protocol that was used to communicate between devices.

[5] 2

(ii) Explain what happens at the link layer (sometimes referred to as the "network interface layer", "network access layer" or simply the "network layer") of the TCP/IP stack when using this program.

At the link layer the MAC addresses (Media access control addresses) of source and destination of data packets are added on to ~~the data packets~~ before transmission and stripped on arrival [2]

6 A website has the following HTML code.

```
<html>
<head>
<title>My Stamp Collection - European Stamps</title>
</head>
<body>
<h1 style="font-family:Arial; color:darkGreen">United
Kingdom</h1>
<p>These are my stamps from the uk.</p>
<!-- Code A -->


<!-- Code B -->

</body>
</html>
```

the site's owner wants to add the photo UKstamps.jpg in place of the comment
`<!-- Code A -->`

The site's owner notices that his site doesn't come up high in the results from a search engine that uses the PageRank algorithm. State what would affect his site's ranking.

The number of sites linked to his site (inbound sites) and the pagerank of each of these inbound sites.

[2]

7 A small manufacturing business uses networked computers with closed source application software installed.

All computers owned by the business are connected together into a Local Area Network (LAN). Various network protocols are used in this network.

(i) Give **three** advantages to the business of connecting computers together in a LAN.

1 The business owner can monitor activity of each computer connected to the LAN

2 Computers on the network can easily share files and resources with each other so they can edit, manage, rename, delete, etc files

3 If the owners wanted to update all the computers or back them up at once, they can do this as all computers are connected to LAN, saves time since don't have to manually update each device. [3]

(ii) Explain what is meant by a network protocol.

A set of rules that need to be followed to allow communication between devices on a network [2]

(iii) Give the names of **two** protocols that may be used in a LAN.

1 File transfer protocol - FTP

2 Simple mail transfer protocol - SMTP

[2]

(iv) Explain why protocol layering is used.

Layering is used so that developers can seperate each layer. This means developers working on one layer can implement things differently to how other layers are implemented. Also if a developer is working on one layer, it won't affect the other layers and cause problems. Layered protocols also allow developers to test each layer individually, to make sure they work as intended. [3]

2

8 *A company has six solicitors working in two offices in different locations. They work with the general public and help them solve any sensitive legal issues they may be facing.

The solicitors would like to set up a computer network to allow them to work together more effectively.

Discuss the benefits and drawbacks of computer networking to the company.

You should refer to the following in your answer:

- Different networking methods
- Cost implications
- Security implications

Topologies: bus, star
models: client-server, P2P, mesh
LAN WAN

There are different models and topologies the company can use. Starting off with models, which are the ways the network

There are 2 main (LAN) types of network the company can choose from, local area networks, where the computers are connected over a small geographical area, or wide area network (WAN) where computers are connected over a large geographical area. The benefits of a LAN are that you don't need external hardware to set it up, like a modem. This makes it easy to set up and cheaper in most cases.

easily

~~Hence~~ The owner can also control how the network functions since the LAN belongs to them, so there is no external connection (only in) making LAN a choice for security. ~~WAN is the other~~ On the other hand, LAN uses a small area and since there are two offices, if these locations are not close or neighbouring, LANs would be ineffective. WANs however, cover a large geographical area, so it can connect the computers in the two offices together, which allows for easy and efficient communication so workers can share ideas and cooperate better. However, WANs may be more expensive since you need extra hardware to set one up, like a modem. They also use connection belonging to third parties, which may pose as a security issue since outsiders can intercept data of company being transmitted around due to the connection not belonging to the company.

Once the type of network is decided, comes the model. The client server model is where the computers are all connected to a central, super computer that manages all the computers, the benefit to this is that the server handles all the backups so the client (employee's) computers don't have to each back up themselves. Also, the server can store [9]

next page (7)

END OF QUESTION PAPER

data and resources that everybody can use and share (on the network).
The drawbacks are that since only six ~~work~~ employees are present, this model may be excessive since they won't need all the computational power of the server, hence it is wasted, and since servers require a lot of hardware and professional staff to maintain, it is a wide expense for only six people who will use the server. Also security wise, it poses a risk since when data is transmitted to server for processing, it can be intercepted.
The other model is peer to peer (P2P). Where all the computers are connected together. This is more suitable as it is still affordable and much cheaper and simpler to set ~~a~~ up. It does not require extra hardware, ~~the~~ ~~It is less~~ workers can also more easily share files because if one connection breaks or fails, they can just share files via different route. However, in general since there is no centralised P2P networks are less secure ~~and~~ computer that manages access rights or monitors activity on network, making it easier for hackers to enter the network and steal ideas and solutions to legal issues which are sensitive for themselves and resell these solutions at cheaper prices which can cause company to lose money.