Data Communication

Standard difficulty · 20 questions · 40 marks · Time: 38 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. The five components of data communication are sender, receiver, message, communication medium and:
   (a) server **(b)** password **(c)** router **(d)** protocol

2. What is the protocol SMTP used for?
   (a) sending e-mail to a mail server
   (b) making voice calls over the Internet
   (c) breaking data into packets and delivering them across the Internet
   (d) a direct link between two computers, such as a dial-up connection

3. Which describes coaxial cable?
   (a) travel in straight lines and need towers in line of sight
   (b) two insulated copper wires twisted together, cheap, used in telephone lines and LANs
   (c) a copper core inside insulation and a braided metal shield, used for cable TV
   (d) work over very short distances and cannot pass through walls, as in a TV remote

4. Which mode of communication is this: a radio station broadcasting to listeners?
   (a) simplex **(b)** full-duplex **(c)** half-duplex **(d)** broadcast only

5. How long does it take to send a 125 GB file over a 50 Gbps link? (1 byte = 8 bits)
   (a) 50 seconds **(b)** 20 seconds **(c)** 160 seconds **(d)** 21 seconds

6. Using 1 Gbps = 1024 Mbps, how many Mbps are 2 Gbps?
   (a) 2048 **(b)** 16384 **(c)** 2000 **(d)** 16

7. A signal uses frequencies from 280 MHz to 440 MHz. What is its bandwidth?
   (a) 160 MHz **(b)** 720 MHz **(c)** 440 MHz **(d)** 360 MHz

8. To which part of the spectrum used for wireless communication does a frequency of 825 KHz belong?
   (a) radio waves **(b)** microwaves **(c)** visible light **(d)** infrared waves

Section B — Short answer — 8 × 2 = 16 marks

9. Name the five components of data communication.

10. How many seconds does it take to send a 200 KB file over a 100 Kbps link? (1 byte = 8 bits)

11. Name the protocol used for (a) transferring files between computers (b) transferring web pages between a web server and a browser.

12. Is this simplex, half-duplex or full-duplex: a wireless intercom where only one side can speak at a time?

13. Using 1 Kbps = 1024 bps and so on, convert (a) 18 Gbps to Mbps (b) 23 Mbps to Kbps.

14. A photo is sent from a phone to a friend's tablet through radio waves. Which component of data communication is radio waves?

15. A wireless link works at 74 GHz. Is it radio waves, microwaves or infrared waves?

16. A link carries 80 Mbps. (a) How many megabytes can it send in 80 seconds? (b) How many kilobits per second is 80 Mbps (1 Mbps = 1024 Kbps)?

Section C — Word problems — 4 × 4 = 16 marks

17. Explain the components of data communication with the example of sending a photo from one phone to another.

18. (a) How long does it take to send a 225 KB file over a 40 Kbps link? (b) And a 110 KB file over a 16 Kbps link? (c) What is the difference between bandwidth and data transfer rate?

19. Compare coaxial cable and twisted pair cable: how each carries data, its speed and distance, and where it is used. Then say which wired medium you would choose to link two buildings 700 m apart, and why.

20. A 9000-byte message is sent by packet switching in packets that carry 1000 bytes of data each. (a) How many packets are made? (b) Must they all take the same route? (c) Give one difference between packet switching and circuit switching. (d) There are 4 routers on the path: how many hops does each packet make from sender to receiver?

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Answer key

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Q	Answer	Working
1	**(d) protocol**	—
2	**(a) sending e-mail to a mail server**	—
3	**(c) a copper core inside insulation and a braided metal shield, used for cable TV**	—
4	**(a) simplex**	—
5	**(b) 20 seconds**	125 GB = 1000 Gb; 1000 ÷ 50
6	**(a) 2048**	2 × 1024
7	**(a) 160 MHz**	440 − 280: bandwidth is the range of frequencies
8	**(a) radio waves**	radio 3 KHz–1 GHz; microwaves 1–300 GHz; infrared 300 GHz–400 THz
9	**Sender, receiver, message, communication medium and protocol.**	—
10	**16 seconds**	200 × 8 = 1600 Kb; ÷ 100
11	**(a) FTP; (b) HTTP**	FTP; HTTP
12	**half-duplex**	simplex: one way only; half-duplex: both ways, one at a time; full-duplex: both ways at once
13	**(a) 18432; (b) 23552**	18 × 1024; 23 × 1024
14	**communication medium**	sender, receiver, message, communication medium and protocol
15	**microwaves**	radio 3 KHz–1 GHz; microwaves 1–300 GHz; infrared 300 GHz–400 THz
16	**(a) 800 MB; (b) 81920 Kbps**	80 × 80 = 6400 Mb ÷ 8; 80 × 1024
17	**The sender is the first phone, the receiver the second, the message is the photo, the communication medium is the wireless link (radio waves) and the networks it passes through, and the protocols are the rules both phones and the network follow to send and receive it.**	—
18	**(a) 45 s; (b) 55 s; (c) bandwidth is the range of frequencies a channel can carry (in Hz); data transfer rate is the number of bits sent per second (in bps).**	225 × 8 ÷ 40; 110 × 8 ÷ 16
19	**coaxial cable: a copper core inside insulation and a braided metal shield, used for cable TV. twisted pair cable: two insulated copper wires twisted**	twisted pair < coaxial < optical fibre in speed and distance

Q	Answer	Working
	together, cheap, used in telephone lines and LANs. For 700 m, optical fibre: it keeps a high speed over long distances without being affected by electrical noise.	
20	**(a) 9; (b) no, each packet may take a different route and they are put back in order at the receiver; (c) circuit switching sets up a dedicated path for the whole call first, while packet switching shares the links and sends each packet on its own; (d) 5**	9000 ÷ 1000; 4 routers make 5 links

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