7(a)	• It can suffer Interference/crosstalk. • … that could have caused data loss/gained/changed.
7(b)	**One** mark for each correct term in the correct place. • odd/even • even/odd (must be opposite of MP1) • bit • echo check • automatic repeat query (ARQ) • timeout • positive/negative or negative/positive A parity check is set to be **odd** or **even**. A parity **bit** is added to each byte before transmission to make it match the set parity. An **echo check** involves comparing the data sent to the data received back from the receiving device. An **automatic repeat query (ARQ)** uses acknowledgement and **timeout**. The acknowledgement system can be **positive** or **negative**.

5(a)	Any **four** from: • A check digit is **calculated** from/using the **barcode data** • … using an algorithm // by example e.g. Modulo 11 • … and added to the **barcode** • When/after the **barcode is scanned** the check digit is **recalculated …** • … using the **same** algorithm • If the **check digits** do not match an error has occurred when scanning the barcode // If the **check digits** match no error has occurred when scanning the barcode
5(b)(i)	• Bits are sent one at a time • Bits are sent down a single wire • Data is sent in one direction only
5(b)(ii)	Any **three** from: • The stock control system may be a long distance away • … parallel should not be used in long distance transmission // Serial is more **reliable** for long distance transmission • The data does not need to be sent quickly • … the increased speed of parallel is not needed • … as only **small** amounts of data need to be sent • The bits are sent/arrived in order • … the **data** will not be skewed // the **data** could be skewed if parallel was used • … there will be no data collisions • There will be less interference/crosstalk (due to single wire) • … there will be fewer errors in the data • No need for a reply/response from stock control system • … **half-duplex/full-duplex** is not necessary as only one way transmission needed
5(b)(iii)	Any **two** from: • (Odd/even) Parity check // Parity byte check // parity block check • Checksum • Echo check • (Positive/negative) ARQ // Automatic repeat query // Automatic repeat request

9(a)	Any **three** from: • Data could be lost • Data could be gained/added • Data could be changed • Bits could be **reassembled** in the wrong order • Interference could occur • Crosstalk could occur • Data collisions could occur • Data packets could time out/reach their hop count • **Network** could be infected with malware
9(b)(i)	Any **eight** from: • The 1s are counted (in each byte) • Each **byte** has a parity bit • If the number of 1s are odd the parity bit **is 0** (otherwise it **is 1**) • (The first packet of) data is sent and a timer is started • The **receiving** device counts the number of 1s (in each byte) • If the **number of 1s are odd/data meets odd parity** an acknowledgement is sent to say the data is error free … • … the sender then sends the next packet of data … • … and the timer is restarted • If the number of 1s is even an acknowledgement is not sent • If **no acknowledgement** is received **within a set timeframe/before timeout** … • … the data packet is resent
9(b)(ii)	Any **two** from: • Echo check • Checksum • Even parity check • Negative ARQ
9(c)(i)	Any **five** from: • Criteria can be set (for traffic) • … such as a **blacklist/whitelist** (of IP addresses) • It will examine traffic coming into the network • It will check that the traffic meets the set criteria • … and will reject it if it does not meet criteria • Certain ports used by hackers can be blocked/closed

9(c)(ii)	Any **two** from: Example: • Virus • Worm • Trojan horse • Spyware • Adware • Ransomware

6 **One** mark for each correct method.

error detection method	statement
parity (check/bit/byte/block)	An odd or even process can be used.
checksum	A value is calculated from the data using an algorithm. This happens before and after the data is transmitted.
echo check	A copy of the data is sent back to the sender by the receiver.
automatic repeat query/request // ARQ	Acknowledgement and timeout are used.
check digit	A value is appended to data that has been calculated using the data. This value is checked on data entry.