

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 <u>algorithm</u> // 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)	<u>Bits</u> 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 <u>bits</u> 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 <u>Bits</u> could be reassembled in the wrong order - Interference could occur - Crosstalk could occur - Data collisions could occur - Data <u>packets</u> 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 <u>parity bit</u> - 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

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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.