

Assignment Submission Coversheet

Faculty of Science, Engineering and Built Environment



Student ID:	218478549
Student Name:	Justin Bland
Campus:	<input type="checkbox"/> Burwood <input type="checkbox"/> Waterfront <input type="checkbox"/> Waurin Ponds <input type="checkbox"/> Warrnambool <input checked="" type="checkbox"/> Cloud

Assignment Title:	Problem Solving Report 1		
Due Date:	August 2 nd 2019	Assessment Item:	1
Course Code/Name:	S334 / Bachelor of Cyber Security		
Unit Code/Name:	SIT202 Computer Networks	Unit Chair / Campus Coordinator:	Prof Jinho Choi
Practical Group: (if applicable)			

If this assignment has been completed by a group or team:

1. Each student in the group must complete and sign a separate coversheet
2. The assignment will be returned to the student in the group nominated below

Assignment to be returned to:
(Student name and Student ID number)

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Signed:	Justin Bland	Date:	Saturday, July 27, 2019
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COMMENTS

Mark Awarded:		Assessor's Signature:		Date:	
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Question-1 (Chapter 3):

1. What is the bit rate?

The bit rate is simply the number of bits transmitted or processed in a given timeframe, usually per second

E.g. 9600 bps is 9600 bits per second

Bit rate can also include prefixes such as Kilo, Mega, Giga, etc

E.g. 10 kbps is 10,000 bits per second

2. If the number of signal level is 8 and the bandwidth is 3 MHz, what is the bit rate?

$$2 * \text{Bandwidth} * \log_2(8)$$

$$2 * 3 * \log_2(8) = 18 \text{ mbps}$$

$$\text{Bandwidth} = 18 \text{ mbps}$$

3. Suppose that the signal-to-noise ratio (SNR) is 6 dB. What is the capacity (in bps) if the bandwidth is 3 MHz?

The capacity or (usable bandwidth) of the signal is calculated using the "Shannon Capacity" formula

$$\text{Capacity(bps)} = \text{Bandwidth(Hz)} * \log_2(1 + \text{SNR})$$

$$\text{Capacity} = 3\,000\,000 \text{ Hz} * \log_2(1 + 6)$$

$$\text{Capacity} = 8\,422\,206 \text{ bits per second}$$

4. Discuss the difference between the data rate and the capacity (e.g., answer why they are different?)

Capacity generally refers to the theoretical maximum speed of the signal, whereas the data rate is the actual speed that that data is travelling over the signal, this might not be as fast the theoretical maximum speed of the signal due to multiple factors such as the level of the signals used, available bandwidth (e.g. Is there other data using the signal) and the quality of the channel (SNR).

Question-2 (Chapters 6, 7, 8):

1. Explain the purposes of multiplexing and demultiplexing?

Multiplexing is the process where data streams from different sources are combined to be transmitted over a single transmission data stream, this is usually achieved with one of two methods, 1, "Time Division Multiplexing" where the transmission data stream is essentially sliced up into time segments and each Source Data Stream is allocated time segments to transmit data. Or 2, "Frequency Division Multiplexing" where each Source Data Stream is allocated a specific frequency on the Transmission Data Stream, Demultiplexing is essentially the reverse of the procedure used to multiplex the data streams into one transmission to separate the Transmission Data Stream into its original multiple Data Streams.

2. Place one of "circuit-switching" and "packet-switching" into the following sentences

Packet Switching can further be divided into two subcategories – virtual-circuit approach and datagram approach.

Circuit Switching takes place at the physical layer.

In Circuit Switching, the resources need to be reserved during the setup phases.

3. Suppose that a packet is transmitted from Host A to Host B. The VIC of the packet at Host A is "C". What is VCI when the packet is arrived at Host B.

Hop	Port	VCI
Host A		C
Switch 1	2	C
Switch 1	1	B
Switch 2	3	B
Switch 2	2	E
Switch 3	0	E
Switch 3	1	H
Host B		H

Question-3 (Chapters 9, 10, 11):

1. Consider the *parity-check code* with 4-bit dataword

- What is the length of the codeword?

7 bits

- How many codewords the code has?

Codewords are added at bit positions that are a factorial of 2, with 4 data bits there should be 3 additional bits dedicated to redundancy

- What is the minimum Hamming distance?

The Minimum Hamming Distance is the smallest distance between two codewords eg.

$$0100 \text{ XOR } 0101 = 2$$

- How many errors can be corrected?

Hamming code can correct 1 bit error and detect 2 bit errors

2. In the following network, two hosts Alice and Bob are connected by three links and two routers. There are two addresses (N: IP address and L: Link layer address) for each interface of hosts and routers. Host Alice sends a datagram to host Bob. The datagram passes through the routers and links to host Bob. Before sending, Alice makes a frame from the datagram, then sends to the router-R1.

Explain how host Alice encapsulates the frame from the datagram, and then explain how Router-R1 and Router-R2 prepare and forward those frames on link-2 and link-3 towards host Bob. Mention how Alice gets R1's link layer address, how routers get next destination and link layer addresses in your explanation. Mention all link layer addresses (source and destination) for all three frames in the links.

Question-4 (Chapters 12 - 17):

1. Choose “Yes” or “No” for each item.

	Are there packet collisions?	Is carrier sensing required?	Is the number of the stations fixed?
TDMA	No	No	No
Polling	No	No	Yes
Slotted-ALOHA	Yes	Yes	No
CSMA/CA	Yes	Yes	Yes

2. Choose all wireless technologies in the followings.

- Bluetooth
- 802.11n

3. Choose “True” or “False” for each item.

In AMPS, CDMA has been used for channelization.	False
Handoff is used in a cellular system to support continuous transmission for a mobile station.	True
In CDMA-based cellular systems, the frequency-reuse factor can be 1.	True
CSMA/CD is used for wireless LAN as it can avoid the hidden node problem.	False