COMP90007 Internet Technologies
Semester 1, 2023
Assignment 1

Due date: April 3rd Monday 4:00 pm (GMT+10)

This assignment is worth 5% of the total marks for the subject. This assignment has 5 questions. The weighting of each question is shown beside the question. **Answers must be submitted as a PDF file via the COMP90007 Assignment 1 submission link in Canvas by the due date. Late submissions will attract a penalty of 10% per day (or part thereof).**

Please ensure your name and student ID are clearly presented on your submission. **Submission should only contain the question number and the answer (do not repeat the text of questions in your submission).** Please present all steps of the solutions for questions involving calculations and/or derivations, otherwise relevant penalties will be applied. Questions can be answered in a few sentences. Excessively long answers will not be accepted. Please type your answers and save as PDF. **Handwritten assignments that are scanned will not be accepted.**

All questions can be answered by studying the material covered. **All work presented should be your original individual effort/work.**

Question 1 (1 point)

Given a 0.5-second video clip with frame rate 30 fps (frames per second), each frame contains 1280 x 720 pixels, which needs 3 bytes/pixel. Assume the video clip is stored as an uncompressed file. If the distance between the sender and the receiver is 10,000 km, what is the latency to send this video clip:

1) over a 1Mbps direct connection where the signal travels at 200,000km/s?
2) over a 100Mbps link via a satellite in Geostationary orbit 36,000km away from both sender and receiver, where the signal travels to and from the satellite at 300,000km/s?

Question 2 (1 point)

Given a channel with 8 kHz bandwidth,

1) if it's a noisy channel, what is the minimum signal-to-noise ratio (in dB) that can support a data rate of 64kbps?
2) if it's a noiseless channel, how should we send the data to support a data rate of 64kbps?

Question 3 (1 point)

32 bit blocks of data are broken into fragments and transmitted using Hamming (7, 4) codes to correct errors.

1) How many fragments are needed for each block?
2) How many bits do we transmit for each block?
3) How can the fragments be organised so that the transmission can be protected from consecutive bit (burst) errors?

Question 4 (1 point)

What are the benefits of having layered model like the one presented in lectures? List at least two benefits. (Please answer this question briefly in a few sentences. Excessively long answers will not be accepted.)

Question 5 (1 point)

Pick an **HTTP based website of your choice** and capture the packets exchanged using Wireshark, depicting the trace created when you access a website via a web browser/wget. (Note: Please review the steps and context that was covered in the Wireshark Lab exercise in Week 2 for this question.)

1) What are the IP addresses of the source (requesting the website) and destination (serving the website)? What steps should we undertake to validate that these IP addresses belong to the aforementioned source and destination and not some other server(s), etc?
2) We have introduced that there are six service primitives for implementing a simple connection-oriented service (as shown in **Table 1**, source: Ch 1.3.4 Tanenbaum & Wetherall, 2011). Select any two of the service primitives from **Table 1** and use the TCP stream captured in your Wireshark trace from the previous subsection, do the following - provide screenshots of your Flow graph diagram and explain what information in this graph corresponds to the two primitives you selected, and why? Please ensure that the graphs are legible in the PDF document, else relevant penalties will be applied.

Primitive	Meaning
LISTEN	Block waiting for an incoming connection
CONNECT	Establish a connection with a waiting peer
ACCEPT	Accept an incoming connection from a peer
RECEIVE	Block waiting for an incoming message
SEND	Send a message to the peer
DISCONNECT	Terminate a connection

Table 1 Service Primitives