COMP90007 Internet Technologies
Semester 2, 2019
Assignment 1

Due date: September 2nd Mon 11:30 am

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 form in the LMS by the due date. The submission link will be open close to the submission time. Late submissions will attract a penalty of 10% per day (or part thereof).**

Please ensure your name and user name are clearly presented. **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)

In a network with a 6-layer architecture and protocol hierarchy, applications generate messages of length M bytes. Assuming each layer has a different header size: 20-byte, 30-byte, 80-byte, 30-byte, 20-byte and 110-bytes for Layers 1, 2, 3, 4, 5, and 6 respectively: What fraction of the network bandwidth is filled with headers? Please show your calculations and briefly explain.

Question 2 (1 point)

An image is 1920 x 1080 pixels with 2KB/pixel (KB is Kilobyte). Assume the image is stored as an uncompressed simple image file. If the distance between the sender and the receiver is 10,000 km, what is the latency to send this image 1) over a 56-kbps simple modem? 2) over a 1-Mbps cable modem? (Assume the speed of the signal for both cases is 200,000 km/second).

Question 3 (1 point)

Given a channel with 4 kHz bandwidth, if we want to send data at 56 kbps, what is the minimum signal-to-noise ratio of the channel that can support this data rate?

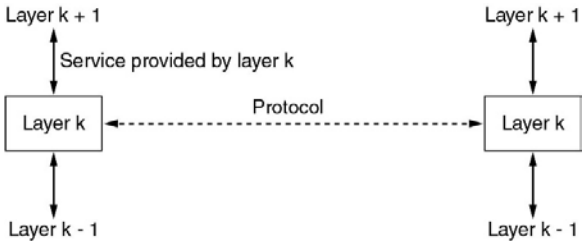
Question 4 (1 point)

1) A stream of bits, 01111011111011111101111100, needs to be transmitted at the data link layer using bit stuffing, what is actually transmitted after the bit stuffing?
2) We are transmitting 16-bit data using a Hamming code. What is the minimum number of check bits is needed to ensure that the receiver can correct a single-bit error?

Question 5 (1 point)

Please answer this question briefly in a few sentences. Excessively long answers will not be accepted.

Given the relationship between a service and a protocol as shown in the following figure



1) Suppose the algorithms used to implement the operations at layer k is changed, how does it impact the operations at layers k - 1 and k + 1?
2) Suppose there is a change in the service provided by layer k, how does it impact operations at layers k – 1 and k + 1?