

COMP90007 Internet Technologies

Semester 1, 2023

Assignment 2

Due date: Wednesday 10 May 2023 5PM (Melbourne Time: AEST)

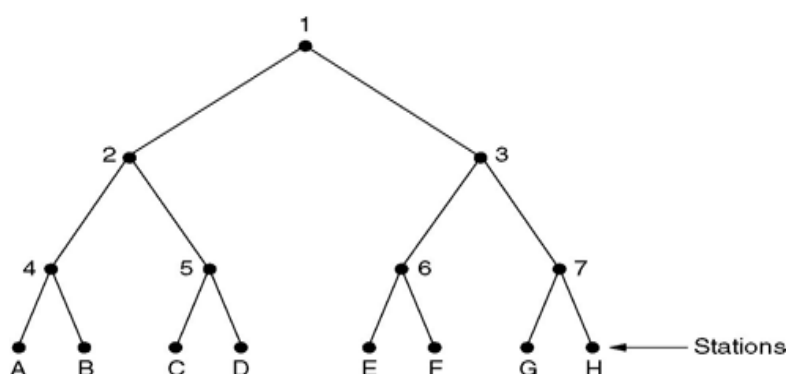
This assignment is worth 5% of the total marks for the subject. This assignment has 5 questions. The mark of each question is shown beside the question. **Answers must be submitted as a PDF file via the COMP90007 Assignment 2 submission link in Canvas by the due date. Late submissions will attract a 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 using tablet or scanned will not be accepted.**

All work presented must be your original individual effort/work.

Question 1 (1 point)

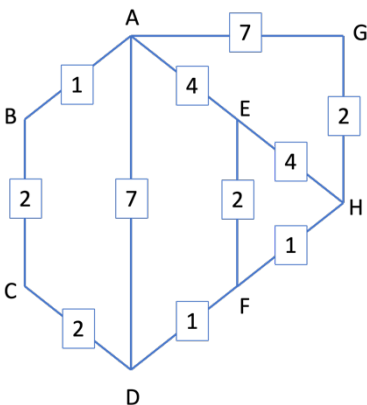
Given a network with 8 stations labelled as A, B, C... H, all stations are competing to transmit using Adaptive Tree Walk protocol. Using the tree given below, show step by step what happens in each time step if A, D, E, G and H are ready to send data at the same time.



Question 2 (1 point)

The shortest path routing is used on a network shown in the figure below, with the weight of each edge in the label.

- (1) What are the weights of shortest paths from A to the other nodes, respectively? Show your calculation and the steps of using Dijkstra’s algorithm in a table.
- (2) If router E is offline, which shortest path(s) in (1) will be impacted, besides the path from A to E? What are the new paths to replace them? List the new paths and their weights.



Your answer for part 1 should complete the following table, adding rows as needed:

step	A	B	C	D	E	F	G	H	Nodes in the tree
1	0	∞	∞	∞	∞	∞	∞	∞	{A}

Question 3 (1 point)

Remote Procedure Call (RPC) mostly uses UDP to communicate procedure call requests and results.

- (1) What are the benefits of using UDP instead of TCP that lead to its use for this application?
- (2) What happens if a single UDP packet is lost during:
 - a. An RPC request?
 - b. An RPC response?
- (3) When might a programmer prefer to use TCP for RPC?

Question 4 (1 point)

We have studied four parameters that define Quality of Service (QoS): Bandwidth, Delay, Jitter and Loss.

- (1) Why are Bandwidth and Jitter important QoS parameters for a video streaming application such as Netflix?
- (2) What technique can the application use to trade increased Delay for reduced Jitter?
- (3) Is this technique also appropriate for a Vide Conferencing application such as Zoom? Why/Why not?

Question 5 (1 point)

A client-server application uses TCP over a network where all packets take 1ms to be transmitted between machines. In this application, the client opens a TCP connection with a 3-way handshake to the server. It transmits 4KB of data to the server in packets containing 1KB each, commencing 1ms after it sends its last packet for the three-way handshake. The client is capable of sending packets at 1ms intervals. The server has a buffer of 2KB and processes data at a rate of 1KB every 2ms, commencing 2ms after the arrival of the first data packet. When the client has received the ACK for its final data packet, it commences the disconnection process. During this whole process, no packets are lost

- (1) Copy and complete the sequence/timing diagram below, showing all the packets being transmitted.
- (2) How long does the process take from commencing transmission of the first packet until the last packet is received?

