Department

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University of Sri Jayewardenepura
M.Sc. in Computer Science
First Semester Course Unit Examination – August 2023

CSC 543 2.0 Data Communication and Networking
Time: Two (02) Hours

This paper consists of 4 questions on 3 pages. Answer all questions.

Question 01. (*A total of* 25 *marks*)

(a) Assume that you are watching a movie stored in a server in America using your mobile phone. With regard to data communication and networking, answer the following questions.

(i) Draw a sketch of a possible network diagram and name four possible network types.

(ii) Name three possible data communication mediums involved in the above scenario and explain a strength and a weakness of each.

(iii) Name three networking protocols involved in the above scenario and explain their responsibilities in brief.

[09 Marks]

(b) Why do we have layered the networking functionalities? Name three layers of TCP/IP five-layer model and explain their role in brief.

[09 Marks]

(c) In different networking layers, different terms are being used to refer to the data being transport. Name the terms that are being used in TCP/IP five-layer model. Moreover, what do you mean by encapsulation and decapsulation in networking? Why do we have encapsulation and decapsulation in networking devices such as switches and routers.

[07 Marks]

Question 02. (*A total of* 25 *marks*)

(a) If two nodes with different communication speeds and finite buffers need to have a reliable and efficient communication over a noisy channel, answer the following questions. You may use diagrams where necessary.

(i) Identify two possible issues that can occur due to the noises in the communication channel.

(ii) Explain how you can solve the above (i) issues.

(iii) The above (ii) simplest solution can slow down the communication speed. Hence, suggest a mechanism to make it more efficient while guaranteeing a solution to the original problem.

[08 Marks]

(b) If the traffic of a communication channel changes dynamically, how can the data sending node know traffic and adjust its sending speed accordingly?

[04 Marks]

(c) Name and briefly explain three channelizing methods that can be used to share a communication channel among multiple nodes.

[06 Marks]

(d) Consider the following codeword 1011011. If the Hamming (7,4) with even parity has been used, answer the following questions.

(i) Is the codeword correct? Justify your answer.

(ii) If the answer for the (i) is no,

a) How many errors are there?

b) Can you correct them? Justify your answer.

[07 Marks]

Question 03. (*A total of* 25 *marks*)

(a) When a user types "http://www.graduate.sjp.ac.lk/" in the address bar of a web browser, browser is able to contact the right webserver and retrieve the relevant content from it. By showing all the major steps, clearly explain how a web browser finds the right server on the internet to retrieve the content.

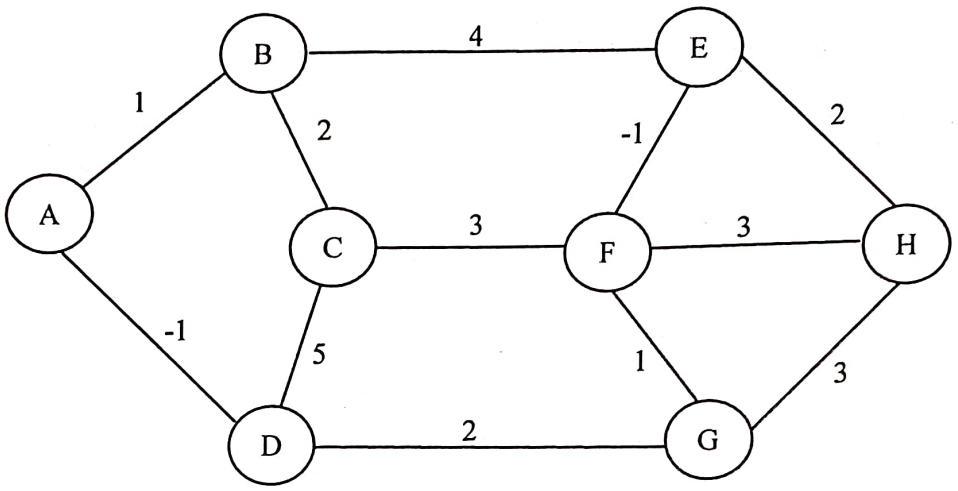
[12 Marks]

(b) If three live websites have been opened in three tabs of a browser, explain how the right content goes to the right tab. Moreover, if multiple users are concurrently accessing the same online shopping site, how can the server send right content to the right user?

[13 Marks]

Question 04. (*A total of* 25 *marks*)

(a) Using a suitable single source shortest path routing algorithm, find the final routing table of node A of the following network diagram. All the intermediate steps need to be shown clearly.



[13 Marks]

(b) Assume that a university has four faculties namely Science, Engineering, Medical, and Commers. The number of computers in each faculty is about 700, 450, 250, and 1000 respectively. Moreover, the Science faculty has three departments with computer laboratories namely Computer Science, Mathematics, and Statistics. There are about 300, 125, and 118 computers in those departments respectively. If one of the computers in university has the 19.163.182.146/20 IP address, answer the following questions. You may assume that the subnetworks have ordered (descending) according to the number of computers in each and only the minimum required number of IP addresses need to be given for each faculty and department (Whatever left need to be preserved for future use).

(i) What is the subnet mask of the Medical faculty?
(ii) What is the network address of the subnet that the above IP address is belong to?
(iii) What is the last usable IP address of the above (ii) subnet?

[12 Marks]

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