



0080

University of Sri Jayewardenepura
M.Sc. in Computer Science
First Semester Course Unit Examination – April/May 2024
CSC 543 2.0 Data Communication and Networking
Time: Two (02) Hours

This paper consists of 4 questions on 3 pages. Answer all questions.
Whenever possible, write your answers in point form (concisely).

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

(a) Clearly explain the following terms and their role/usage in data communication and networking.

- (i) BAN
- (ii) Bandwidth
- (iii) Datagrams
- (iv) Core Network
- (v) Microwaves

[02x5 Marks]

(b) Briefly explain the major functionalities of the following layers in TCP/IP five-layer model in computer networking.

- (i) Data link layer
- (ii) Transport layer
- (iii) Networking layer

[03x3 Marks]

(c) Briefly explain the role/responsibilities of the following networking protocols.

- (i) DNS
- (ii) IMAP
- (iii) ARP
- (iv) ICMP

[01x4 Marks]

(d) Write the following IPv6 address in the simplified way.

4002 : 00A3 : 0000 : 0000 : 0000 : 004D : 0000 : 09FB

[02 Marks]

Question 02. (A total of 25 marks)

- (a) Assume that two nodes with different communication speeds and finite buffers need to communicate over a noiseless channel efficiently and reliably. Identify possible issues that can occur in the above scenario and suggest suitable techniques that can be used to address those issues. You may use diagrams where necessary.

[07 Marks]

- (b) Name three random access protocols that can be used to access a communication medium and compare their pros and cons.

[02x3 Marks]

- (c) If the following bits need to be transferred via a noisy communication channel, find the checksum value that need be sent together with the data to detect its correctness at the receiving end.

10011010 11010101 01011100 10010001

[06 Marks]

- (d) What is multiplexing and demultiplexing in computer networking? Using a suitable example, explain how multiplexing and demultiplexing are being used in computer networks.

[06 Marks]

Question 03. (A total of 25 marks)

- (a) Briefly explain the “Hidden node problem” and the “Exposed node problem” in networking.

[03x2 Marks]

- (b) Name three connecting devices used in three different layers of computer networks. Further, explain their major responsibilities in the respective layer together with the types of data and addressing they are handling.

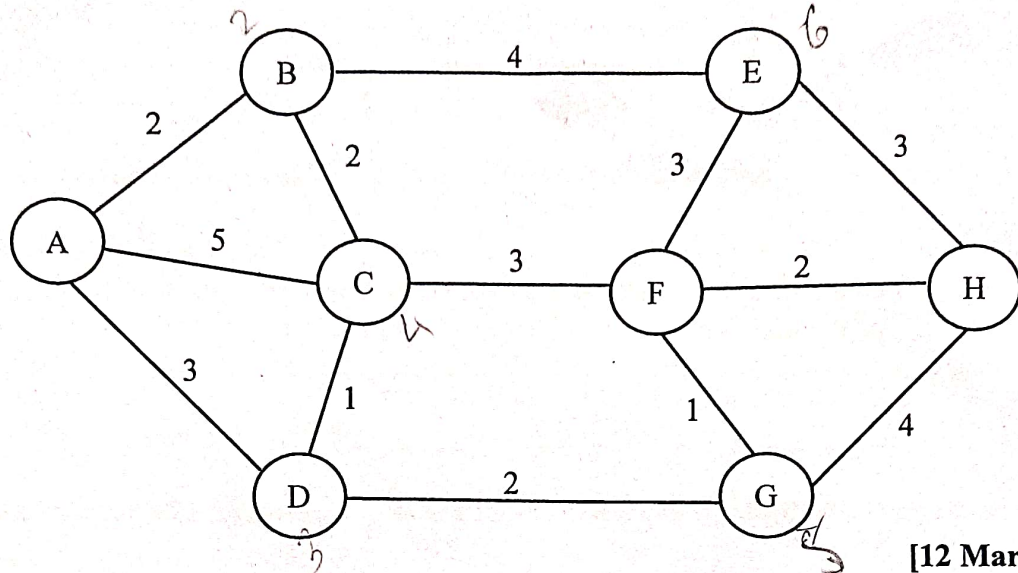
[03x3 Marks]

- (c) If multiple users are simultaneously accessing a website, how can the right content go to the right user? Clearly explain how the computer networks address the above requirement.

[10 Marks]

Question 04. (A total of 25 marks)

- (a) Using a suitable rapidly converging 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.



[12 Marks]

- (b) An ISP is given a public IP range to serve its clients in the most effective manner. The ISP has divided its clients into three main groups namely A, B, and C where clients in each subnetwork of the above groups can facilitate 2000, 1000, and 200 computers accessing the network respectively. Group A consumes half of the ISP's original address space and Group B, and C equally consume the rest. Further, the address space of each main group is again divided into three subgroups X, Y, and Z, where each can facilitate half ($1/2$), quarter ($1/4$), and one eighth ($1/8$) of its main groups address space. (eg: if ISP's original address space consists of n number of IP addresses, Group B_i represents $n/4$ addresses and Subgroup B_iZ_j represents $n/32$ addresses; where i , and j are the indexes (zero-based) of groups and subgroups respectively)

If one of the IPs of ISP is 143.16.23.175, and the address spaces are divided according to the alphabetical order, answer the following questions. Moreover, you may assume that the ISP's subnet mask is /19.

- How many subnetworks can be defined under the Group B (B_i 's)?
- What is the subnet mask of C_3 (zero-based indexing) sub network?
- What is the network address (Subgroup) of the subnetwork that the 143.16.23.175 IP address is belong to?
- What is the subnet mask of the above (iii) subnetwork?
- What is the last usable IP address of the above (iii) subnetwork?

[13 Marks]

*** END OF PAPER ***