



University of Kelaniya – Sri Lanka
Centre for Distance & Continuing Education
Bachelor of Science (General) External
First Year Second Semester Examination – 2023
2025 May
Faculty of Science

COSC 17533 – Data Communication and Networks

No. of Questions: **Five (05)**

No. of Pages: **Three (03)**

Time: **Two and half (02 ½) hrs.**

Answer **ALL** questions.

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01. a) (i) What is data communication? (06 marks)
(ii) List and briefly describe the five components of a Data Communication System. (15 marks)
(iii) What is the difference between half-duplex and full-duplex transmission modes? (12 marks)
- b) (i) Categorize the four basic physical topologies in terms of line configuration. (12 marks)
(ii) State two (02) advantages and one (01) disadvantage of Mesh topology. (12 marks)
(iii) Describe how to build a hybrid topology with a star backbone and three (03) ring networks using a diagram. (12 marks)
- c) (i) What is a protocol in Data communication? (06 marks)
(ii) Briefly describe the three (03) key elements of a protocol. (15 marks)
(iii) What is meant by “De Jure” standard in networking? (10 marks)
02. a) (i) Define *bit rate* and *baud rate* in Signals. (10 marks)
(ii) Briefly explain the three (03) types of transmission impairments. (15 marks)
(iii) List the three (03) main factors that affect the bit rate. (10 marks)
- b) Encode the following bit stream:
1100000000111000011
(i) Using bipolar AMI encoding scheme, assuming that the polarity of the first 1 is positive. (10 marks)
(ii) Using B8ZS encoding scheme, assuming that the polarity of the first 1 is negative. (10 marks)

- (iii) Using HDB3 encoding scheme, assuming that the number of 1s so far is even and the polarity of the first 1 is positive. (10 marks)
- c) (i) List and briefly describe the three sampling methods used in Pulse Amplitude Modulation (PAM). (10 marks)
- (ii) Compare and contrast Pulse Code Modulation (PCM) and Delta Modulation (DM). (10 marks)
- (iii) Assume that there is an available bandwidth of 100 kHz which spans from 200 kHz to 300 kHz. Find the carrier frequency and bit rate, if it modulates the data using Amplitude Shift Keying (ASK) with the modulation process related factor (d) is 1. (15 marks)
03. a) (i) What is meant by "Address Space" in logical addressing? (09 marks)
- (ii) Differentiate between boundary-level masking and non-boundary level masking. (12 marks)
- (iii) Give three (03) advantages of IPv6 over IPv4. (09 marks)
- b) Find the subnetwork address for the following cases:
- (i) IP address 130.54.34.9, Mask 255.255.0.0 (10 marks)
- (ii) IP address 200.65.44.51, Mask 255.255.255.192 (12 marks)
- c) Assume that an organization has been allocated the IP address block of 195.43.126.0
- (i) Indicate the class of the above IP address. (12 marks)
- (ii) It is necessary to share this address among 8 subnets within the organization. What will be the subnet mask? (12 marks)
- (iii) How many computers can be connected to each subnet? (12 marks)
- (iv) List ranges of IP addresses appropriate for each of these subnets. (12 marks)
04. a) (i) Categorize the layers of the Opens Systems Interconnection (OSI) model in terms of the network support layers and the user support layers. (12 marks)
- (ii) What is meant by the peer-to-peer process? (10 marks)
- (iii) Briefly describe the importance of *encapsulation* when transmitting data through the layers of a network model. (12 marks)
- b) (i) State five (05) responsibilities of the Physical Layer in the Internet model. (15 marks)
- (ii) Briefly describe two (02) services provided by the application layers in the internet model. (12 marks)
- c) (i) What is the difference between the Address Resolution Protocol (ARP) and the Reverse Address Resolution Protocol (RARP)? (12 marks)
- (ii) State the usage of the Internet Control Message Protocol (ICMP) and the Internet Group Management Protocol (IGMP). (12 marks)

- (iii) State and briefly describe the three (03) types of IP addresses used for the hosts. **(15 marks)**
05. a) (i) How does guided media differ from unguided media? **(12 marks)**
 (ii) Briefly describe sky propagation and line-of-sight propagation. **(12 marks)**
 (iii) What is the difference between omnidirectional waves and unidirectional waves? **(12 marks)**
- b) (i) Briefly describe the significance of the twisting in twisted pair cable. **(10 marks)**
 (ii) List two (02) coaxial cable connectors. **(10 marks)**
 (iii) State three (03) advantages of fiber optics over twisted- pair and coaxial cable. **(12 marks)**
- c) (i) Briefly describe the two (02) propagation modes used in fiber optic cables. **(12 marks)**
 (ii) A noisy channel has a signal-to-noise ratio of 63 and a bandwidth of 1 MHz. Calculate the maximum bit rate and the number of signal levels supported by this channel. **(20 marks)**

//***** End of the Question Paper ***** //

