

Data communication and Computer Network

Introduction

1. Differentiate between Point-to-point network connection and Multiplication network connection. [CU 2010 2012]
Or
What are the advantage of multipoint network connection over Point-to-point network connection?
2. Categories the basic topologies in terms of line configuration.State their advantage and disadvantage. [CU 2007 2008 2012 2013]
3. Why are protocols needed? What are the key elements of a protocol? [CU 2010]
4. What is a communication protocol? What is protocol-converter? [CU 2007]
5. What are the three different categories of network?
6. State the full forms of the following abbreviations- ARPA, ARPANET, NCP, ISP, NAP
7. What are the full categories in which data communication standard fall. State the name of some standard creation committees.
8. “The primary goal of networking is resource sharing” - Comment on it emphasizing the various resources that one can share through networking. [CU 2010]
9. What are the essential components to establish a network among computers? Briefly explain. [CU 2007]
10. What do you mean by LAN, MAN and WAN? [CU 2008]
11. What are the factors which determine whether a system is LAN, MAN or WAN? [CU 2010]
12. How many standard alternative forms form of LAN is available? Explain their characteristic features. [CU 2007]
13. If there are n number of devices in a network, what will be the no of links required for a mesh, star, ring and bus topology? [CU 2007]

Network models

1. Why layered architecture is implemented in data communication and network?State the significance of layered architecture. [CU 2008]
2. What is OSI model of data communication and computer network? Explain in brief the function of each layer of OSI MODEL.
3. Write a short note - Layers of OSI model in computer network. [CU 2007]
4. Transport layer is sometimes called *host-to-host* or *end-to-end* layer while network layer is not. Justify the reason. [CU 2009]
5. what do you mean by peer-to-peer process?what is meant by interfaces between layers?
6. What do you mean by TCP/IP protocol suite? Differentiate between OSI model and TCP/IP protocol suite.
7. How many levels of address are employed in an internet employing TCP/IP protocol suite Explain the relationship between layers and address in TCP/IP.
8. Which reference model has been developed to device standard for global communication across heterogeneous computer platform? [CU 2007]

9. Sketch a diagram showing each of the layers in the TCP/IP model. Include the position of each protocol layer in the diagram. [CU 2014]
10. What do you mean by TCP/IP protocol suite? Describe the functions of each layer with necessary diagram. How do the layers of this model correlate with the layers of OSI model? [CU 2010 2012 2013]
11. What is the difference between a port address, a logical address and a physical address? [CU 2006]

Data & Signal

1. Define data and signal. Classify both of them with explanations.
2. What is sine wave? Explain the parameters on which a sine wave can be represented.
3. When the frequency of a signal is considered to be zero and infinity respectively?
4. By a suitable diagram explain signals with different phases.
5. Define wavelength. What are the parameters on which wavelength of a signal depends? What is unit of measurement of wavelength?
6. By using suitable diagram differentiate between Time-domain and Frequency domain plot. What do you mean by a composite signal? State the result on decomposition of a composite periodic signal and composite non-periodic signal.
7. Define bandwidth with respect to a composite signal.
8. Define bit rate and bit length. Explain how a digital signal be considered as a composite analog signal.
9. Explain baseband and broadband channel by stating their channel requirements.
10. Distinguish between low-pass channel and base-pass channel.
11. What do you mean by transmission impairment? Explain the significance of the unit decibel in transmission impairment. [CU 2006 2010]
12. What is signal to noise ratio?
13. What are the factors on which data rate depends?
14. State Nyquist Bit Rate and Shannon Capacity. [CU 2012]
15. Define and explain the following terms - throughput, latency, queuing time, and jitter.
16. If signal to noise ratio is 7 dB and bandwidth is 10 KHz, find the capacity of the channel. [CU 2014]
17. What is channel capacity? How is it related to bandwidth? [CU 2010]
18. "Digital communication is considered to be better than analog communication in terms of the quality being transmitted" - Justify the statement. [CU 2008 2009]
19. Write the advantages and disadvantages of using digital transmission. [CU 2008]
20. How a periodic function is represented in time domain and frequency domain?
21. Find out the amplitude of different frequency components and constant terms in frequency domain. [CU 2006]

Error detection and correction

1. What do you mean by error detection and correction. [CU 2006 2007]
2. Why error detection followed by re-transmission is preferred? [CU 2006]
3. "Performance of LRC is better than VRC" - Justify. [CU 2008]
4. What is CRC? What is the relationship between the size of CRC remainder and the divisor? [CU 2009 2011 2012]
5. Write an algorithm for CRC error detection mechanism. [CU 2008]
6. If M be the k bit message, F be the n-bit FCS, generated by CRC, T be the (k+n) bit frame to be transmitted and P be the (n+1) bit predetermined divisor, then prove that T/P has no remainder. [CU 2008]
7. Suppose that the frame size is 1024 bits, and bit-error rate is 10^{-4} . A source transmits 10 frames/ sec to a destination. What is the probability that all the frames will reach the destination without errors? [CU 2009]
8. The data rate of a channel is 1200 bps. What will be the maximum length of burst error if a noise exists 0.2 sec in the channel? [CU 2008]
9. What are the different techniques of error detection during data transmission? [CU 2007]
10. Why error detection followed by retransmission is preferred? [CU 2006]

Digital-to-digital conversion

1. Define line coding.State the common characteristics of line-coding schemes.
2. Define the terms Baseline wandering, DC Component, Self-synchronization.
3. Explain the different line coding schemes available with suitable examples. [CU 2013]
4. Explain the NRZ, NRZ-I, NRZ-L,RZ, Manchester and Differential Manchester line coding schemes for the following bit streams 01001110, 011100110, 110100010. [CU 2011]
5. State the main disadvantage of RZ line coding scheme.
6. What do you mean by Block coding? Explain with suitable diagram.

Analog-to-digital conversion

1. Explain the significance of analog-to-digital conversion.
2. What is PCM? Explain the process of PCM encoder and PCM decoder. [CU 2009 2010 2011]
3. On what factors does the data rate of a PCM modulated signal depend? [CU 2009]
4. What is sampling rate or sampling frequency? What should be the sampling rate in PCM according to Nyquist theorem? What is sample and hold?
5. Explain quantization technique.Explain quantization level and error?
6. Explain the maximum data rate of a channel is determined by Nyquist theorem by starting proper arguments?
7. Explain the mechanism of DM. Explain the DM components (Modulator and Demodulator).
8. Define scrambling and its purpose.
9. Describe PAM and PCM with suitable example. [CU 2013]
10. In how many ways the transmission of binary data can be accomplished across a link?
11. Differentiate between - serial and parallel transmission. [CU 2007]

12. Explain the mechanism of asynchronous serial transmission and synchronous serial transmission. What is isochronous transmission?
13. An analog signal is limited to 4KHz. It is converted to a PCM signal using 8 bit/sample. What is the bit rate on the transmission line? [CU 2014]
14. In a PCM system, it is required to digitize voice data which are limited to frequencies below 4000 Hz. Every sample value is quantized into one of 256 different levels, what will be the maximum data rate in bits per second? Use sampling theorem to do this. [CU 2010]
15. An analog signal is sampled at the rate of 10 KHz, each sample digitized into 1024 discrete levels, and then transmitted over a digital communication channel. What is the minimum required bandwidth of the channel? [CU 2009]

Digital-to-analog conversion

1. Explain the significance of Digital-to-analog conversion. What are common methods of Digital-to-analog conversion?
2. Define carrier signal. State its role in analog transmission. [CU 2008]
3. With respect to the following binary stream explain ASK, FSK, and PSK.
4. State the bandwidth requirements for ASK, FSK, and PSK. [CU 2012]
5. Why QPSK is implemented? Explain the concept of constellation diagram and its role in analog transmission.
6. Draw the waveforms of (i) ASK (ii) FSK and (iii) PSK for the data 110101100. [CU 2014]
7. Draw a constellation diagram for 8 PSK. [CU 2013]
8. How is the baud rate related to transmission bandwidth of FSK and PSK? [CU 2012]
9. If the bit rate of a signal is 10000 bits/ sec, determine how many bits can be sent in 100 milliseconds? [CU 2012]
10. What is the number of bits per signal element for the following
 - (a) PSK with 8 different phases
 - (b) QAM with a constellation of 256 points. [CU 2008]
11. Draw constellation diagrams for QAM with
 - (a) 2 different amplitudes and 8 phases separated by 45°
 - (b) 4 different amplitudes and 4 phases separated by 90°

Which one is better and why? [CU 2008]

Analog-to-analog conversion

1. Explain the significance of Analog-to-analog conversion.
2. Explain AM. How the total bandwidth of AM can be determined?
3. Explain FM. How the total bandwidth of AM can be determined?
4. Compare and contrast between AM & FM. [CU 2012]
5. Explain PM. How the total bandwidth of AM can be determined?
6. Which of three Analog-to-Analog conversion technique is most susceptible to noise? Justify.

Multiplexing

1. State the notion of multiplexing and spreading.
2. Explain the concepts of multiplexing using suitable diagram. Categorize the methods of multiplexing. **[CU 2007]**
3. Distinguish between a link and a channel in multiplexing.
4. Explain FDM. State some applications of FDM? **[CU 2010]**
5. What is the need for guard bands? **[CU 2005 2006 2010]**
6. Explain WDM. What is dense WDM?
7. Why TDM is implemented? Categorize TDM. Define Time slot and Frames.
8. Differentiate between TDM & FDM. Which of these two techniques are used for communication over (i) a wireless medium (ii) optical fibre. **[CU 2006 2009 2011]**
9. Define interleaving. State the significance of Interleaving.
10. Explain the terms-Multilevel multiplexing, multiple-slot allocation and Pulse stuffing or Bit padding.
11. Define framing bits with respect to frame synchronization in TDM.
12. Compare synchronous TDM and statistical TDM with an example. **[CU 2008]**
13. What is the purpose of multiplexing? **[CU 2014]**
14. What do you mean by framing in the context of TDM? Illustrate with the help of a diagram with four transmitting stations. **[CU 2009]**
15. Five signal sources are multiplexed using TDM. Each source produces 100 characters (8 bits each) per second. Assume that there is byte interleaving and that each frame requires one bit for synchronization. What is the frame rate? What is the bit rate on the path? **[CU 2009]**
16. We have 4 sources, each creating 250 characters/ sec. If the interleaved unit is character (which are represented in 8-bit ASCII code) and one synchronizing bit is added to each frame, find
 - (a) Data rate of each source
 - (b) The duration of each character in the source
 - (c) The frame rate
 - (d) Duration of each frame
 - (e) The number of bits in each frame
 - (f) The data rate of the link **[CU 2008]**
17. How can 4000 Hz voice channels be multiplexed into 60 KHz band using guard bands? **[CU 2006]**
18. Find the maximum bandwidth for the path that using FDM with 5 devices each requiring 4000 Hz and 200 Hz guard band for each device. **[CU 2005]**
19. Show diagrammatically and explain how channels are combined into groups, groups into super groups and super-groups into master-groups? **[CU 2007]**

Transmission media

1. How do guided media differ from unguided media?
2. Differentiate between UTP and STP.
3. What are the connectors of UTP, co-axial cables, fibre-optic cable?
4. State the application of twisted-pair cable, co-axial cables, fibre-optic cable.
5. Explain the working of optical fibre with suitable diagram. **[CU 2012 2013]**

6. Differentiate between multi-mode and single mode optical fibre. [CU 2009 2011 2013]
7. State the advantage and disadvantage of Fibre-optic cable.
8. Differentiate between Omni director and unidirectional waves.
9. What are the three major classes of guided media?
10. What is the purpose of cladding in optical fibre?
11. Why twisting is done in twisted pair cable? [CU 2009]
12. How does sky-propagation differ from line-of-sight propagation?
13. State the advantage of Fibre-optic cable over twisted-pair and Co-axial cables?
14. State some application of infra-red.
15. Which of the transmission media cannot carry analog signal? [CU 2007]
16. State the advantages of optical fibre cable over co-axial cable. [CU 2007]
17. Briefly explain the working of the optical fibre with suitable diagram. Differentiate between multi-mode and single mode optical fibre. [CU 2012 2013]
18. For very high speed communication applications, which of the between single mode and multi- mode optical fibre is preferred and why? [CU 2009]
19. Compare radio wave and microwave with respect to their characteristics, uses and application. [CU 2006]