

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: CS307

Course Name: DATA COMMUNICATION (CS)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

- 1 Define simplex, half duplex and full duplex transmission mode. Give one example for each. (3)
- 2 List and explain different factors which determine the performance of communication in a network? (3)
- 3 Write physical and transmission characteristics of Optical Fibre Cable guided transmission media. (3)
- 4 What are the advantages of microwave transmission over radio wave transmission? (3)
 For a parabolic reflective antenna with a diameter of 2m, operating at 12 GHz. Calculate the antenna gain? Given effective area = 56π .

PART B

Answer any two full questions, each carries 9 marks.

- 5 a) (a) Explain time domain and frequency domain concept of a signal in a communication system. (5)
 b) List various impairments and explain how they affect information carrying capacity of a communication link? (4)
- 6 a) How does cross talk occurs in twisted pair cables? Give the purpose of CAT5e, CAT6, CAT7 twisted pair cables. (5)
 b) Show that doubling the distance between transmission antenna and receiving antenna attenuates the power received by 6dB. (4)
- 7 a) Define Channel Capacity. What key factors affect highest data rate for noiseless channel and noisy channel? (5)
 Signal to Noise Ratio is often given in decibels. Assume $SNR_{db}=36$ and the channel bandwidth is 2Mhz. Calculate theoretical channel capacity?
 b) Explain following wireless propagation modes (4)
 (i) Ground wave propagation (ii) Sky wave propagation

PART C

Answer all questions, each carries 3 marks.

- 8 Give the significance of delta modulation over pulse code modulation during the process of transforming analog data in to digital signal. (3)
- 9 Show the equivalent analog sine-wave pattern of the bit string 00110101 using amplitude shift keying, frequency shift keying and phase shift keying (3)
- 10 What are the advantages of using multiplexing in data communication? How does a synchronised time division multiplexer stay synchronized with de-multiplexer on receiving end? (3)
- 11 What type of multiplexing is preferred in optical fibre communication? Justify your answer (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) For the bit stream 11000110010, sketch the wave form for each of the code of NRZ-I, NRZ-L, Bipolar-AMI, Pseudoternary, Manchester, Differential Manchester. (5)
- b) Explain the modulation technique used in Asymmetric Digital Subscriber Line (ADSL) and cable modems (4)
- 13 a) With suitable example explain the working principle of Code division multiplexing for CDMA technology. (5)
- b) Explain the frame format of Synchronous Optical Network (SONET) for the version SDH. (4)
- 14 a) State Sampling theorem. With help of suitable diagrams, explain the process of transforming analog data into digital signal using Pulse Code Modulation technique. (5)
- b) How Time division Multiplexing (TDM) handle disparity in the input data rate, if data rate of all input lines are not same? (4)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Explain with suitable diagram, how asynchronous and synchronous connections are used in data communication. (5)
- b) Explain major types of noise occur during data transmission, which causes errors. (5)
- 16 a) Why would you expect a CRC to detect more errors than a parity bit? For P=110011 and M=11100011, Find CRC. (5)
- b) With suitable examples explain sliding window error control mechanism in data communication. (5)
- 17 a) Give any two reasons why baseband signal cannot be directly transmitted in a wireless system? How Frequency Hopping Spread Spectrum (FHSS) spread the baseband signal for transmission. (5)
- b) How does spread spectrum eliminates narrow band interferences? Explain Direct Sequence Spread Spectrum (DSSS) technique. (5)
- 18 a) What are the different architectural components in public communication network? Explain its working principle. (5)
- b) Explain the datagram approach for packet switching network. What is the significance of packet size in packet switching network? (5)
- 19 a) Given the dataword 1001001111 and the divisor 10111, show the generation of the CRC codeword at the sender site using binary division. (5)
- b) Calculate the hamming pairwise distance among following codewords; (5)
- i) 00000, 10101, 01010 ii) 000000, 010101, 101010, 110110
- 20 a) List four major components of packet switch and write their function (5)
- b) With suitable example illustrate working of virtual circuit approach for packet switching (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: CS307

Course Name: DATA COMMUNICATION (CS)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks

Marks

- | | | |
|---|--|-----|
| 1 | Mention the purpose of cladding in Optical Fibres? | (3) |
| 2 | What is the channel capacity for a teleprinter channel with a 300-Hz bandwidth and a signal-to-noise ratio of 3 dB, where the noise is white thermal noise? | (3) |
| 3 | What is Bandwidth? A periodic signal has a Bandwidth of 20 Hz. The Highest frequency is 60 Hz. What is the lowest Frequency? Draw the Spectrum if the signal contains all frequencies of same amplitude. | (3) |
| 4 | Indicate some significant differences between broadcast radio and microwave. | (3) |

PART B

Answer any two full questions, each carries 9 marks

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|---|---|-------|
| 5 | a) Differentiate between Attenuation and Delay Distortion. | (4.5) |
| | b) For a parabolic reflective antenna operating at 12 GHz with a diameter of 2 m, Calculate the effective area and the antenna gain. | (4.5) |
| 6 | a) Briefly discuss Line of Sight Propagation. | (4.5) |
| | b) Assume that a TV picture is to be transmitted over a channel with 4.5 MHz Bandwidth and a 35 dB SNR Ratio. Find the capacity of the channel. | (4.5) |
| 7 | a) What is the thermal noise level of a channel with a bandwidth of 10 KHz carrying 1000 Watts of power operating at 50°C? | (4.5) |
| | b) Explain the following terms: | (4.5) |
| | i) Direct broadcast satellite (DBS) ii) Isotropic antenna | |

PART C

Answer all questions, each carries 3 marks

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|----|--|-----|
| 8 | Find the Bandwidth for a signal transmitting at 12 Mbps for QPSK. The value of $d=0$. | (3) |
| 9 | Encode the given bit stream using NRZ-I. 100010001111 | (3) |
| 10 | What is CDMA? Explain. | (3) |
| 11 | Explain Space Division Multiplexing. | (3) |

PART D

Answer any two full questions, each carries 9 marks

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|----|---|-------|
| 12 | a) Differentiate between Synchronous TDM and Statistical TDM. Why is a statistical time division multiplexer more efficient than a synchronous time division multiplexer? | (4.5) |
|----|---|-------|

- b) With a neat Sketch discuss the various steps involved in PCM. (4.5)
- 13 a) Given the bit pattern 101110001. Encode the stream using BFSK and QPSK. (4.5)
- b) Explain frequency division multiplexing. How is interference avoided by using FDM? (4.5)
- 14 a) Explain the analog modulation techniques briefly. (4.5)
- b) Discuss Synchronous Optical Network (SONET). (4.5)

PART E

Answer any four full questions, each carries 10 marks

- 15 a) In a CRC error-detecting scheme, choose divisor polynomial $P: x^4 + x + 1$. Encode the bits 10010011011. (7)
- b) Why would you expect a CRC to detect more errors than a parity bit? (3)
- 16 a) What is meant by Hamming distance? (3)
- b) Derive a Hamming code for single bit error correction (For a data of length 7 Bit). (7)
- 17 a) Discuss synchronous transmission. How is synchronization provided for synchronous transmission? (7)
- b) What is a major disadvantage of asynchronous transmission? (3)
- 18 a) Explain the difference between datagram and virtual circuit operation. (7)
- b) What is the significance of packet size in a packet-switching network? (3)
- 19 a) What are the advantages of packet switching compared to circuit switching. (7)
- b) What is meant by setup phase in circuit switching? (3)
- 20 Explain the following terms: (10)
- i) DSSS ii) FHSS

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FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CS 307

Course Name: DATA COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|--|-----|
| 1 | What are the three parameters that represent a general sine wave? Explain with suitable figures. | (3) |
| 2 | Which wireless propagation is suitable for satellite communication? Justify your answer. | (3) |
| 3 | How the construction of optical fibre helps in reducing the interference? Draw the structure of optical fibre. | (3) |
| 4 | Discuss the significance of SNR in determining the performance of a data communication system. | (3) |

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PART B

Answer any two full questions, each carries 9 marks.

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|---|---|-----|
| 5 | a) Explain the role of Shannon capacity formula in determining the channel capacity. | (4) |
| | b) Suppose the spectrum of a channel is between 3MHz and 4MHz and SNR_{dB} is 24 dB. What is the capacity of the channel? Based on Nyquist's formula, how many signalling levels are required? | (5) |
| 6 | a) Explain different wireless propagation modes with suitable diagrams. | (6) |
| | b) Given a receiver with an effective noise temperature of 300 K and a 12-MHz bandwidth, what is the thermal noise level at the receiver's output? | (3) |
| 7 | a) With the help of suitable diagrams, differentiate multi-mode and single-mode optical fibres. How are the rays propagated in step-index and graded-index multi-mode fibres? | (6) |
| | b) A signal travels from point A to point B through a transmission channel that has -0.4dB/km loss. If the signal at A has a power of 3mW, what is the power of the signal at point B which is 10 km away from A? | (3) |

PART C

Answer all questions, each carries 3 marks.

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|----|---|-----|
| 8 | Compare the terms signal element and data element with suitable diagrams. | (3) |
| 9 | Show the equivalent square wave pattern of the bit string 00110101 using NRZ-I, NRZL and Manchester encoding schemes. | (3) |
| 10 | Which of the multiplexing technique is suitable for fiber-optics links? Explain | (3) |

with reasoning.

- 11 How upstream and downstream data transfer is done in cable modem? (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) What is the advantage of differential encoding? Discuss differential Manchester encoding scheme with example. (3)
b) Explain the process involved in PCM with neat diagrams. (6)
- 13 a) Explain the process of statistical time division multiplexing. (7)
b) Explain the necessity of pulse stuffing in synchronous time division multiplexing. (2)
- 14 a) Why you need scrambling in digital encoding? Explain any one scrambling technique. (7)
b) What is the Nyquist sampling rate for a low pass signal with bandwidth of 300 Khz? (2)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Discuss the effect of timing error in asynchronous transmission. Draw suitable figures. (5)
b) Which are the different types of errors? Explain with examples (2)
c) Assuming even parity, find the parity bit for each of the following data : (3)
i. 1010101 ii. 000000 iii. 10000101
- 16 a) Define Hamming distance and minimum Hamming distance? Calculate the pair wise Hamming distance and minimum Hamming distance among the following code words: 100000, 100110, 111101 (6)
b) What should be the minimum hamming distance for detecting and correcting upto n number of errors? Discuss the reasoning with some example. (4)
- 17 Using CRC, given the dataword 11110000 and the divisor 10011 (10)
i. Show the generation of the codeword at the sender site
ii. Show the checking of the codeword at the receiver site
- 18 Explain direct sequence spread spectrum using BPSK with neat diagrams. (10)
- 19 a) Compare and contrast circuit switching and packet switching techniques (4)
b) Describe the different types of switching fabrics used in Packet switches. (6)
- 20 Explain the datagram approach in packet switching. (10)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: CS 307

Course Name: DATA COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|---|-----|
| 1 | Describe simplex, half-duplex and full-duplex transmission modes with suitable examples. | (3) |
| 2 | Identify the significance of Nyquist bandwidth and Shannon capacity formula in determining the performance of communication in a network. | (3) |
| 3 | Discuss time domain and frequency domain concept of a signal . Draw the frequency domain plot of a periodic signal. | (3) |
| 4 | How the twisting affects performance in twisted pair cable ? | (3) |
| | | () |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|---|-----|
| 5 | a) What are the various transmission impairments and explain how they affect performance of a communication link? | (9) |
| 6 | a) Define Channel Capacity. Calculate the appropriate bit rate and signal levels for a channel with 100 Mhz bandwidth and SNR of 255. | (5) |
| | b) Compare terrestrial and satellite microwave transmission. | (4) |
| 7 | a) Explain the working principle of parabolic reflective antenna with suitable diagrams. | (5) |
| | b) For a parabolic reflective antenna with a diameter of 4 m, operating at 13 GHz, what is the effective area and the antenna gain? | (4) |

PART C

Answer all questions, each carries 3 marks.

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|----|--|-----|
| 8 | Name any two line coding schemes which provide self-synchronization. Explain with reasoning. Draw the pattern for any one of such scheme for the following data: 10101111. | (3) |
| 9 | Explain how Statistical TDM utilizes channel bandwidth better than Synchronous TDM. | (3) |
| 10 | How interference is avoided in frequency division multiplexing? Explain with suitable figures. | (3) |

- 11 Explain SONET/SDH frame format. (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) Encode the bit stream **10101010** into the following line coding schemes assuming that the last signal level has been negative: (6)
- i) NRZ-I
 - ii) NRZL
 - iii) Manchester
 - iv) Differential Manchester
 - v) Bipolar AMI (Most recent preceding 1 bit has negative voltage)
 - vi) Pseudoternary (Most recent preceding 1 bit has negative voltage)
- b) Convert the bit stream 101010 in to analog signals by using ASK, Binary FSK and Binary PSK (3)
- 13 a) Explain Frequency Division Multiplexing process. (6)
- b) Discuss Digital Carrier Systems. (3)
- 14 a) With neat diagram, explain delta modulation technique. (6)
- b) Discuss wave length division multiplexing. (3)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Differentiate Synchronous and Asynchronous transmissions (5)
- b) How errors are detected using parity checking? What are the limitations of parity checking? (5)
- 16 a) Using CRC, given the dataword 1010011110 and the divisor 10111 (10)
- i. Show the generation of the codeword at the sender site
 - ii. Show the checking of the codeword at the receiver site
- 17 a) An error detection and correction scheme has a minimum Hamming distance, $d_{\min}=6$. (5)
- i) How many bit errors can it detect?
 - ii) How many bit errors can it correct?
- b) What is the Hamming distance for each of the following codewords: (4)
- a. d (10000, 11000)
 - b. d (10101, 10010)

c. d (11111,11111)

d. d (000, 100)

- 18 a) Discuss Frequency hopping spread spectrum technique (10)
- 19 a) What is Circuit switching? Explain the three phases in Circuit switching with suitable diagrams. (10)
- 20 a) Compare and contrast Datagram and Virtual-circuit packet switched networks? (5)
- b) With the help of a neat block diagram, explain the structure of a packet switch. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B. TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

Course Code: CS307

Course Name: DATA COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|--|-----|
| 1 | Given a receiver with an effective noise temperature of 294k and a 10 MHz bandwidth. Find out the thermal noise level at the receiver's output in dBW? | (3) |
| 2 | Define frequency, phase and wavelength of a signal | (3) |
| 3 | What are the advantages of optical fiber cable compared to twisted pair cable? | (3) |
| 4 | Explain the reflective property of a parabolic antenna? | (3) |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|---|-----|
| 5 | a) If the spectrum of a channel is between 3MHz and 4 MHz and $SNR_{dB} = 24$ dB. Then calculate the Shannon Channel capacity? Also find out the number of levels required to achieve the above capacity, by using Nyquist's formula? | (5) |
| | b) Compare multimode step index fiber and multimode graded index fiber. | (4) |
| 6 | a) Explain analog and digital data transmission. | (4) |
| | b) Describe briefly ground wave propagation. | (5) |
| 7 | a) Explain the different types of noise that affect the performance of a communication system? | (4) |
| | b) Give the physical description of satellite microwave communication system. Mention some applications. | (5) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|----|--|-----|
| 8 | Encode the bit pattern 01001100011 using Differential Manchester encoding technique. | (3) |
| 9 | Define Sampling Theorem. | (3) |
| 10 | What is byte interleaving technique in Time Division Multiplexing | (3) |

- 11 Draw the STS-1 frame format of SONET. (3)

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) The carrier frequency and difference frequency of an MFSK signal are 250 kHz and 25 KHz. Given that the number of different signal elements (M) is 8 (L= 3 bits). Find out the different frequency assignments for each of the eight possible 3 bit data combinations. (5)
- b) Justify that the frequency spectrum of input signal will move to high frequency bands by FDM process. (4)
- 13 a) Explain any one analog data to analog signal encoding method with neat waveform. (4)
- b) In a CDMA process two users are having the codes as given below. (5)
User1: 1,1,1,1
User2: 1,-1,-1,1
Explain the data transmission process if user1 wants to transmit a bit 0 and user2 wants to transmit a bit 1.
- 14 a) Describe the two main distortions that can be occurred in a Delta modulated waveform. How can it be avoided? (4)
- b) Differentiate statistical TDM and Synchronous TDM using suitable diagrams. (5)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Which are the different types of error? (4)
- b) Explain asynchronous and synchronous data transmission modes with frame structures? (6)
- 16 a) Compare packet switching and circuit switching. (4)
- b) Describe the three phases in a circuit switching operation. (6)
- 17 a) In a CRC error detecting scheme, choose divisor polynomial $P: x^4 + x + 1$. Encode the bits 110101011. (7)
- b) What is hamming distance? (3)
- 18 a) Explain the general model of spread spectrum in digital communication system. (5)
- b) How Frequency Hopping Spread Spectrum(FHSS) spreads the baseband signal for transmission? (5)

- 19 a) Generate the CRC code for the data word of 110010101. The divisor is 10101. (5)
b) Explain 2-dimensional parity check with an example. (5)
- 20 a) Explain virtual circuit approach in packet switching. (5)
b) Explain datagram approach in packet switching. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Fifth semester B.Tech degree examinations (S) September 2020

Course Code: CS307

Course Name: DATA COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|---|-----|
| 1 | Explain the three most significant transmission impairments. | (3) |
| 2 | Express the Time domain and frequency domain representations of a signal with frequencies 0, 8 and 16Hz. | (3) |
| 3 | Transmission characteristics of Fibre Optic cable differs from Coaxial cable. How? | (3) |
| 4 | For multicast communications which type of wireless transmission waves are suitable? Justify your answer. | (3) |

PART B

Answer any two full questions, each carries 9 marks.

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|---|---|-----|
| 5 | a) A telephone line is known to have a loss of 20dB. The input signal power is measured as 0.5W, and the output noise level is measured as 4.5 μ W. Using this information, calculate the output signal to noise ratio in dB. | (5) |
| | b) Find the maximum distance between two antennas for LOS transmission if one antenna is 100 m high and the other is at ground level. | (4) |
| 6 | a) Explain in detail transmission modes of Fibre optic cable? | (5) |
| | b) How capacity of a system is determined in the presence of noise? We have a channel with a 1MHz bandwidth. The SNR for this channel is 63. Then calculate channel capacity. | (4) |
| 7 | a) How Nyquist theorem applied for a noiseless channel? We need to send 265 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need? | (5) |
| | b) Briefly discuss Line of Sight propagation. | (4) |

PART C*Answer all questions, each carries 3 marks.*

- 8 Differentiate between NRZL and NRZI encoding techniques with examples. (3)
- 9 Four 1-kbps connections are multiplexed together. A unit is 1 bit. Find (3)
- (a) The duration of 1 bit before multiplexing,
- (b) The transmission rate of the link,
- (c) The duration of a time slot.
- 10 Explain the various steps involved in Pulse Code Modulation. (3)
- 11 Write short note on CDMA. (3)

PART D*Answer any two full questions, each carries 9 marks.*

- 12 a) We have an available bandwidth of 100 kHz which spans from 200 to 300 kHz. What are the carrier frequency and the bit rate if we modulated our data by using ASK with $d = 1$? (5)
- b) Explain SONET frame format? (4)
- 13 a) Draw the Manchester and Differential Manchester encoding schemes for the data 01001100011. (4)
- b) Write the importance of Digital carrier system. (5)
- 14 a) A multiplexer combines four 100-kbps channels using a time slot of 2 bits. Show the output with four arbitrary inputs. What is the frame rate? What is the frame duration? What is the bit rate? What is the bit duration? (5)
- b) What is the total bandwidth required for frequency modulation. Explain with neat sketch. (4)

PART E*Answer any four full questions, each carries 10 marks.*

- 15 a) Compare the characteristics of Synchronous and Asynchronous transmission. (5)
- b) The data to be transmitted is given below. If it is send with odd parity, what will be the parity bit generated? (5)
- a) 11010
- b) 000000
- c) 01010000
- d) 11111
- e) 0000110
- 16 Using CRC, given the data word 100100 and the divisor is 1101 (10)

- i. Show the generation of the code word at sender site
 - ii. Show the checking of code word at receiver site
- 17 a) Calculate the pair wise hamming distance among following pair of code words (6)
and find the minimum Hamming distance?
 - a) (10101, 11110,01011)
 - b) (00011110,10101001,10100110,00001110)
- b) Define different types of errors occur in data transmission with example. (4)
- 18 a) Why is circuit switching inefficient for transmission of nonvoice data? (5)
- b) Discuss the transmission of packets using the datagram approach in packet switching. (5)
- 19 a) Explain the General Model of Spread Spectrum System. (5)
- b) Explain direct sequence spread spectrum with neat sketch. (5)
- 20 a) Show the characteristics of Frequency Hopping Spread Spectrum System. (4)
- b) Compare the mechanism of space division switch to the mechanism of time division switch? (6)
