

Reg No.: _____

Name: _____

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

Course Code: IT203

Course Name: DATA COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) With the help of a block diagram, discuss the key elements of a data communication model. (3)
- b) List the advantages and disadvantages of optical fiber communication. (5)
- c) What are different polar schemes? Encode the data bits 010110011010 using all three polar schemes. (7)
- 2 a) Define the term bandwidth. Assume that a periodic signal is composed of five sine waves with frequencies 200, 400, 600, 800 and 1000Hz. Determine the bandwidth. Draw the spectrum assuming all components have a maximum amplitude of 5V. (3)
- b) Define channel capacity. Distinguish between Nyquist bit rate and Shannon capacity. (5)
- c) With the help of neat sketches, discuss the three main methods to perform digital-to-analog conversion. (7)
- 3 a) How is encoding done in 2B1Q multilevel binary encoding technique? (3)
- b) Define the term attenuation. The loss in a cable is usually defined in decibels per kilometre (dB/km). If the signal at the beginning of a cable with -0.3 dB/km has a power of 2 mW, determine the power of the signal at 5 km. (5)
- c) What are the two biphasic schemes? Encode the data bits 01010010110 using biphasic schemes. (7)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) With the help of neat sketches, discuss the PCM encoding process. (7)
- b) Consider an alphabet which consists of three symbols A, B and C with probability of occurrences $P(A) = 0.2$, $P(B) = 0.5$ and $P(C) = 0.3$. Encode the string BAC using Arithmetic Coding. Also decode the number 0.49 to obtain the original message that was transmitted. (8)

- 5 a) Explain the various methods of encoding analog data into analog signals. (7)
- b) List the steps of Huffman coding algorithm. Consider a DMS with seven symbols x_i , $i=0,1,2,3,4,5,6$ and corresponding probabilities $P(x_0) = 0.25$, $P(x_1) = 0.25$, $P(x_2) = 0.125$, $P(x_3) = 0.125$, $P(x_4) = 0.125$, $P(x_5) = 0.0625$, $P(x_6) = 0.0625$. Generate the codewords using Huffman coding technique and calculate the efficiency of the code. (8)
- 6 a) What are block codes? Discuss about simple and two-dimensional parity check code for error detection. Give appropriate examples. (7)
- b) Discuss the two spread spectrum techniques. (8)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) List the key features of RS codes. (5)
- b) Compare the features of WiFi and WiMax. (7)
- c) What is CRC? Consider the message denoted by the polynomial $x^9 + x^8 + x^6 + x^4 + x^3 + x + 1$ and the generator polynomial $x^4 + x + 1$. Calculate the CRC and show the message transmitted by the sender. Assume that the third bit from the left is inverted at the receiver. Show how the receiver detects the error using CRC. (8)
- 8 a) What are BCH codes? (5)
- b) Differentiate between single-bit errors and burst errors. Give examples for both. (5)
- c) How many redundancy bits are required to generate the Hamming code for a 7-bit data? Assuming even parity, generate the Hamming code for the 7-bit data word 1001101. If the fifth bit from the left of the received codeword is changed to 0, can this be detected? Give reasons for your answer. (10)
- 9 a) Distinguish between systematic and unsystematic codes. (5)
- b) With the help of a suitable example, explain the significance of a parity check matrix. (7)
- c) With the help of neat sketches, discuss circuit switching and packet switching. (8)
