Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree Examination (Regular and Supplementary), December 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   Consider a noiseless channel with a bandwidth of 3000 Hz transmitting a signal with two signal levels. Calculate the maximum bit rate.   (3)

2   What are the important characteristics of a periodic analog signal? If a periodic signal is decomposed into five sine waves with frequencies of 250, 300, 600, 700, and 950 Hz, what is its bandwidth?   (3)

3   What are the advantages of optical fibre communication?   (3)

4   Explain Line of Sight propagation with sufficient diagram.   (3)

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

5   a)   Determine the maximum data rate for a channel having a bandwidth of 2MHz if   (6)

   i) SNR_{dB} is 0 dB

   ii) SNR_{dB} is 10dB

   b)   How can we say that a signal is periodic or non-periodic if its frequency domain plot is given?   (3)

6   a)   Explain the various transmission impairments that can affect a communication system.   (6)

   b)   What is the function of twisting in a twisted pair cable?   (3)

7   a)   Explain terrestrial microwave and satellite microwave transmission.   (6)

   b)   An ideal isotropic antenna is propagating microwave signals at a frequency of 500 MHz. Calculate the free space loss in dB if the receiving antenna is located 20 km away from the transmitting antenna.   (3)

PART C
Answer all questions, each carries 3 marks.

8   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?   (3)

9   Encode the bit stream 10010110 using NRZ-L and NRZ-I.   (3)

10   A bandpass signal has a bandwidth of 4MHz. To convert to digital signal, what is (3)
the minimum sampling rate required for this signal?

11   What are the features of Frequency Division Multiplexing?   (3)

PART D
Answer any two full questions, each carries9 marks.

12 a) Explain the various steps involved in a Pulse Code Modulation system.   (6)

     b) Convert the bit stream 101010 into analog signals by using ASK and BFSK.   (3)

13 a) Explain Code Division Multiple Access with suitable diagram.   (6)

     b) Draw and explain SONET STS-1 frame format.   (3)

14 a) Explain how Statistical TDM utilizes channel bandwidth better than Synchronous (6)
TDM.

     b) Draw Manchester and Differential Manchester encoding schemes for the data (3)
0100110.

PART E

Answer any four full questions, each carries 10 marks.

15 a) How are errors detected using parity checking? If the following sets of bits are sent (6)
with even parity, what should be the parity bits generated?

       a) 1100110   b) 0000100   c) 111111   d) 1111011

     b) Differentiate Synchronous and Asynchronous transmission giving the frame format (4)
of each.

16 a) Define Hamming distance. What is the Hamming distance for each of the following (6)
codewords:

      a. d (10000, 00000) b. d (10101, 10000)   c. d (11111, 11111)

      d. d (000, 101)

     b) What are the conditions for minimum Hamming distance to a) detect 's' errors b) (4)
correct 't' errors ?

17 a) Suppose we want to transmit the message 11001001 and protect it from errors (6)
using the CRC polynomial $x^3 + 1$. Determine the message that should be
transmitted using division method. Corrupt the left most third bit of the transmitted
message and show that the receiver can detect the error using CRC technique.

     b) Distinguish between forward error correction and error correction by (4)
retransmission.

18 a) Differentiate Datagram and Virtual-circuit packet switched networks.   (6)

   b) Define Frequency hopping spread spectrum and explain how it achieves bandwidth   (4)
       spreading.

19 a) Explain the structure of a packet switch with the help of a neat sketch.   (6)

   b) What are the advantages of packet switching compared to circuit switching?   (4)

20 a) Explain Direct sequence spread spectrum with sufficient figures.   (6)

   b) What are the characteristics of virtual circuit network that are common to datagram   (4)
       and circuit switched networks?

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