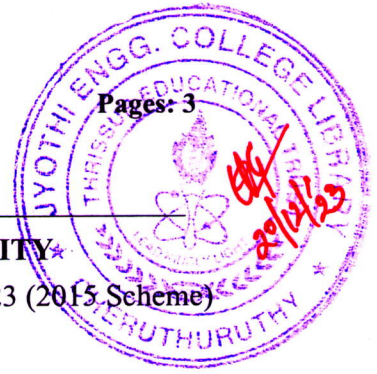Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S, FE) / S5 (PT) (S, FE) Examination December 2023 (2015 Scheme)

Course Code: CS307
Course Name: DATA COMMUNICATION

Max. Marks: 100   Duration: 3 Hours

PART A
Answer all questions, each carries 3 marks.

      Marks

1. With a neat diagram, describe the different components in a communication model.   (3)

2. The periodic signal is decomposed into 7 sine waves with frequencies of 200, 600, 800, 100, 300, 1100 and 1000 Hz. What is bandwidth? Draw the spectrum, assuming all components have a maximum amplitude of 5V.   (3)

3. Differentiate between Attenuation and Delay Distortion.   (3)

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

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

5. a) Distinguish between Nyquist bandwidth and Shannon capacity. Consider a noiseless channel with a bandwidth of 3000 Hz transmitting a signal with (i) Two signal levels (ii) Four signal levels. Determine the maximum bit rate in both cases.   (5)

    b) List various impairments and explain how they affect information carrying capacity of a communication link?   (4)

6. a) Explain following wireless propagation modes   (4)

      (i) Ground wave propagation (ii) Sky wave propagation

    b) Show that doubling the distance between transmission antenna and receiving antenna attenuates the power received by 6dB.   (5)

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?   (5)

    b) Indicate some significant differences between broadcast radio and microwave.   (4)

PART C
Answer all questions, each carries 3 marks.

8 Given the bit pattern 101110001. Encode the stream using BFSK and ASK. (3)

9 What is the advantage of differential encoding? Discuss differential Manchester encoding scheme with example. (3)

10 Which of the multiplexing technique is suitable for fiber-optics links? Explain with reasoning. (3)

11 Explain the frame format of Synchronous Optical Network(SONET) for the version SDH. (3)

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

12 a) With a neat Sketch discuss the various steps involved in PCM. (5)

b) We have an available bandwidth of 100 kHz which spans from 200 to 300kHz. What are the carrier frequency and the bit rate if we modulated our data by using ASK with $d = 1$? (4)

13 a) Explain how Statistical TDM utilizes channel bandwidth better than Synchronous TDM. (3)

b) With suitable example explain the working principle of Code division multiplexing for CDMA technology. (6)

14 a) With neat diagram, explain delta modulation technique. (3)

b) Explain the techniques to convert analog data to analog signal with suitable diagrams. (6)

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

15 a) Define the basic types of errors in data communication. (5)

b) In a CRC error-detecting scheme, Encode the bits $x^{10}+x^7+x^4+x^3+x+1$ with the divisor polynomial P: $x^4 + x + 1$, find the code word. (5)

16 a) What is meant by Hamming distance? Calculate the pair wise Hamming distance and minimum Hamming distance among the following code words: (5)

i) 00000,10101,01010

ii) 000000,010101,101010,110110

b) An error detection and correction scheme has a minimum Hamming distance, (5)
$d_{min}= 6$.

    i) How many bit errors can it detect?

    ii) How many bit errors can it correct?

17 a) Using CRC, given the dataword 1010011110 and the divisor 10111 (10)

    i. Illustrate the generation of the codeword at the sender site

    ii. Illustrate the checking of the codeword at the receiver site if the fifth bit is altered at the receiver.

18 a) What is Circuit switching? Explain the three phases in Circuit switching with (10) suitable diagrams.

19 a) Explain direct sequence spread spectrum with neat sketch. (5)

  b) Give any two reasons why baseband signal cannot be directly transmitted in a (5) wireless system? How Frequency Hopping Spread Spectrum(FHSS) spread the baseband signal for transmission.

20 a) Apply Direct Sequence Spread Spectrum to the data 101 using the Barker sequence (5) 10110111000. Show the encoding and decoding steps.

  b) Explain the difference between datagram and virtual circuit operation. (5)

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