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**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**THIRD SEMESTER B.TECH DEGREE EXAMINATION (Regular), FEBRUARY 2022****(2020 SCHEME)****Course Code: 20CST285****Course Name: Data Communication****Max. Marks: 100****Duration: 3 Hours****PART A***(Answer all questions. Each question carries 3 marks)*

1. Describe simplex, half-duplex and full-duplex transmission modes with suitable examples.
2. a) Suppose the power we use at home has a frequency of 60 Hz. Determine the period of this sine wave.  
b) Draw a sine wave with a phase of 90 degree starting at time 0 with a peak amplitude.
3. How the twisting affects performance of twisted pair cable?
4. For a parabolic reflective antenna operating at 4GHz with a diameter of 5 m, Calculate the effective area and the antenna power gain.
5. Show the NRZ, Manchester and Differential Manchester encodings for the bit pattern 1 0 0 1 1 1 1 1 0 0 1 0 0 0 1
6. Identify the two main distortions that can be occurred in a Delta modulated waveform. How can it be avoided?
7. Distinguish between synchronous and statistical Time Division Multiplexing.
8. Five channels, each with a 100-kHz bandwidth, are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 kHz between the channels to prevent interference?
9. Explain the operation of a single circuit-switching mode.
10. Calculate the CRC value for the data 100100 with generator 1101

**PART B***(Answer one full question from each module, each question carries 14 marks)***MODULE I**

11. a) Suppose that a black-and-white digitized TV picture is to be transmitted from a source that uses a matrix of 480X500 picture elements (pixels), where each pixel can take one of 32 intensity values. Assume that 30 pictures (or frames) are sent per second.
  - i) What is the source rate in pixels/second?
  - ii) What is the source rate R in bits/sec?
  - iii) How the parameters could be modified to allow transmission of color TV signals without increasing the required value for R?
  - iv) Assume that the TV picture is to be transmitted over a channel with 4.5 MHz bandwidth and a 35 dB signal-to-noise ratio. Find the capacity of the channel in bits per second?

(10)

- b) What are the various transmission impairments and explain how they affect performance of a communication link? (4)

**OR**

12. a) Explain time domain and frequency domain concept of a signal in a communication system. (8)
- b) Consider a channel with a 1-Mbps capacity and an SNR of 63.
- i) What is the upper limit to the data rate that the channel can carry? (6)
- ii) The result of part (a) is the upper limit. However, as a practical matter, better error performance will be achieved at a lower data rate. Assume we choose a data rate of 2/3 the maximum theoretical limit. How many signal levels are needed to achieve this data rate? (6)

**MODULE II**

13. a) Explain the various types of guided transmission media and its applications (9)
- b) Explain the working principle of parabolic reflective antenna with suitable diagrams. (5)

**OR**

14. a) Discuss Satellite Microwave and Terrestrial Microwave along with their transmission characteristics (9)
- b) What you mean by LOS in communication and explain Ground wave propagation. (5)

**MODULE III**

15. a) Given the bit pattern 010110010, encode this data using ASK, BFSK, and BPSK. (6)
- b) With a neat Sketch discuss the various steps involved in PCM. (8)

**OR**

16. a) Explain any two analog to analog modulation techniques with examples. (7)
- b) Give a comparative study of Multilevel Binary and Biphase encoding techniques (7)

**MODULE IV**

17. a) The transmitted signal in a GSM system is of 200kHz bandwidth and 8 users share a common bandwidth using TDMA. If at a given time 12 users are talking in a cell, what is the total bandwidth of the signal received by base station of the cell? Mention the reason. (5)
- b) Explain the difference of DSSS and FHSS with examples. (9)

**OR**

18. a) Explain the working principle of code division multiplexing with an example. (6)
- b) Compare statistical TDM and Synchronous TDM using suitable diagrams. (8)

**MODULE V**

19. a) What is the significance of packet size in a packet-switching network? Explain with example (6)
- b) Illustrate any two error detection mechanisms with examples. (8)

**OR**

20. a) Explain Asynchronous transmission and Synchronous Transmission with characteristics. (6)
- b) Write down the algorithm for Eleven-bit Hamming code and illustrate it with the data 1011001. (8)

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