**B.E. COMPUTER SCIENCE & ENGINEERING 3RD YEAR 1ST SEMESTER EXAM- 2019**

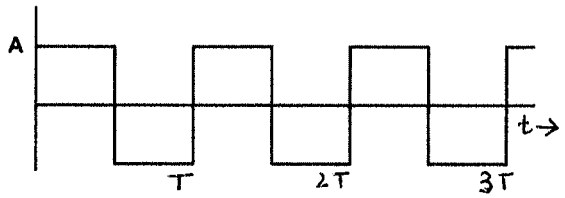
**DIGITAL COMMUNICATION SYSTEM**

Time: 3 hours | Full Marks: 100

**Group A (Total Marks: 20) [CO1]**
**Answer Question No. 1 (Compulsory) and Question No. 2 OR Question No. 3**

1. Explain the functionalities of each layer of TCP/IP protocol suite with suitable diagrams. 10

2. Explain important criterions for an effective and efficient network? Assume hypothetically that we have two links of same delay say 5 sec. The bandwidth of these links are 1bps and 5bps respectively. Discuss the performance of these two links. Consider a square wave form as shown below. Decompose it into its harmonics and show the frequency domain representation. 2+4+4




3. Why two separate frequencies are used for uplink and downlink transmission in case of satellite communication? Assume that we have a digital signal of bit rate N. Discuss the approximation (rough and better) of this digital signal with an analog signal in a low-pass channel with limited bandwidth. What is the required bandwidth of a low pass channel if we need to send 500 kbps by using baseband transmission? 2+6+2

**Group B (Total Marks: 10) [CO2]**
**Answer any one i.e., Question No. 4 OR Question No. 5**

4. What are the factors responsible for attenuation in case of terrestrial microwave communication? What is intermodulation noise? Assume that $SNR_{dB}=36$ and the channel bandwidth is 2 MHz. What are the appropriate bit rate and signal level? 3+3+4

5. What is crosstalk? How is it minimized in case of twisted-pair of wire? Distinguish between attenuation distortion and delay distortion. The digital signal is to be designed to permit 160 kbps for a bandwidth of 20 KHz. Determine (a) number of levels and (b) SNR. 2+2+2+4

**Group C (Total Marks: 30) [CO3]**
**Answer Question No. 6 (Compulsory) and Question No. 7 OR Question No. 8**

6. Why do we need encoding of data before sending over a medium? What is quantization error? How can it be reduced? What is the result of scrambling the sequence 11100000000000 using a) B8ZS b) HDB3 scrambling techniques? Assume that the last non-zero signal level has been positive. Explain in accordance with the rules of each scheme. 2+3+5+5

7. Consider the following data streams a) 00000000 b) 11111111 c) 01010101 d) 00110011
Draw the graphs of i) NRZ-L ii) NRZ-I iii) Manchester iv) Differential Manchester and v) AMI using each of the given data streams, assuming that the last signal level has been positive. What is the bandwidth (average) requirement for these schemes? 10+5

8. Compare i) NRZ-L ii) NRZ-I iii) Manchester iv) Differential Manchester and v) AMI schemes in respect to baseline wandering, DC component and synchronization problems. 5X3

**Group D (Total Marks: 10) [CO4]**
**Answer any one i.e., Question No. 9 OR Question No. 10**

9. Compare the bandwidth requirement of the three analog-to-analog modulation techniques. Define FHSS and explain how it achieves bandwidth spreading. 6+4

10. Compare the bandwidth requirement of the three digital-to-analog modulation techniques. Define DSSS and explain how it achieves bandwidth spreading. 6+4

**Group E (Total Marks: 10) [CO5]**
**Answer any one i.e., Question No. 11 OR Question No. 12**

11. Discuss the concept of redundancy in error detection and correction. Differentiate linear block code and cyclic code. Obtain the codeword for the original message 1010000 using the generator polynomial $x^3+1$. Assume that one single error occurred in left most bit position of the transmitted message. Show how the decoder will detect that. 2+2+6

12 What are the conditions to guarantee i) the detection of at least $k$ errors and ii) the correction of at least $m$ errors in a block code? A sender needs to send the four data items 0xAB, 0xCD, 0xEF and 0xFA. Find the checksum at sender site. Also find the checksum at receiver site when the third data item is changed to 0xEE. 4+6

**Group F (Total Marks: 20) [CO6]**
**Answer Question No. 13 (Compulsory) and Question No. 14 OR Question No. 15**

13. Compare and contrast byte-stuffing and bit stuffing. Discuss the design of Stop-and-Wait ARQ protocol. 4+6
14. What is piggybacking? Explain its advantages? There is no pipelining in Stop-and-Wait ARQ protocol. Discuss the design of a protocol which improves the efficiency of transmission by using pipelining. 2+2+6
15. Consider the use of 10 K-bit size frames on a 10 Mbps satellite channel with 270 ms delay. What is the link utilization for stop-and-wait ARQ technique assuming $P = 10^{-3}$? Go-back-N ARQ is very inefficient for a noisy link. Discuss the design of a protocol to address this issue. 4+6