

**RUSTAMJI INSTITUTE OF TECHNOLOGY**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**  
**DATA COMMUNICATION (IT-501)**  
**Assignment-II**

**Course Instructor – Mrs Mala Saraswat**

**Due on 15 Oct 2011**

- Q1) Calculate Hamming check bits (odd) for following data  
a) 11111111 b) 10010001
- Q2) Five signal sources are multiplexed using TDM. Each source produces 100 characters per second. Assume that there is byte interleaving and that each frame requires 1 bit for synchronization. What is frame rate? What is bit rate on the path?
- Q3) Compare UTP, coaxial and fiber optic cables in term of physical construction, transmission rate, susceptibility towards noise, network span
- Q4) What are advantages of digital technology over analog technology
- Q5) Explain baseband and broadband transmission. Discuss attenuation and distortion noise.
- Q6) Describe asynchronous transmission control scheme with frame structure
- Q7) Explain difference between ISDN terminal equipment and ISDN network termination equipment
- Q8) What is digital subscriber line? Compare ADSL, SDSL and VDSL, HDSL.
- Q9) What is synchronous digital hierarchy? What is data rate of SDH? Explain STM-I.
- Q10) Find checksum for the following bit sequence. Assume a 16bit segment size.  
a) 1001101101010101  
b) 0001010101110011
- Q11) In a single bit error correction, a code of 3 bits can be in one of four states: no error, first bit in error, second bit in error and third bit in error. How many of these 3 bits should be redundant to correct this code? How many bits can be actual data? Also find how many redundant bits should be in a 10 bit code to detect an error.
- Q12) . We need a three-stage space-division switch with  $N = 100$ . We use 10 crossbars at the first and third stages and 4 crossbars at the middle stage.  
a). Draw the configuration diagram.  
b). Calculate the total number of crosspoints.  
c). Find the possible number of simultaneous connections.  
d). Find the possible number of simultaneous connections if we use one single crossbar (100 x 100).  
e). Find the blocking factor, the ratio of the number of connections in c and in d.

- Q 13) Two channels, one with a bit rate of 190 kbps and another with a bit rate of 180 kbps, are to be multiplexed using pulse stuffing TDM with no synchronization bits. Answer the following questions:
- What is the size of a frame in bits?
  - What is the frame rate?
  - What is the duration of a frame?
  - What is the data rate?
- Q 14) Four channels, two with a bit rate of 200 kbps and two with a bit rate of 150 kbps, are to be multiplexed using multiple slot TDM with no synchronization bits. Answer the following questions:
- What is the size of a frame in bits?
  - What is the frame rate?
  - What is the duration of a frame?
  - What is the data rate?
- Q15) We need to use synchronous TDM and combine 20 digital sources, each of 100 Kbps. Each output slot carries 1 bit from each digital source, but one extra bit is added to each frame for synchronization. Answer the following questions:
- What is the size of an output frame in bits?
  - What is the output frame rate
  - What is the duration of an output frame?
  - What is the output data rate?
  - What is the efficiency of the system (ratio of useful bits to the total bits).
- Q16) Consider an  $n \times k$  crossbar switch with  $n$  inputs and  $k$  outputs.
- Can we say that switch acts as a multiplexer if  $n > k$ ?
  - Can we say that switch acts as a demultiplexer if  $n < k$ ?
- Q17) A path in a digital circuit-switched network has a data rate of 1Mbps. The exchange of 1000 bits is required for the setup and teardown phases. The distance between two parties is 5000 km. Answer the following questions if the propagation speed is  $2 \times 10^8$  m:
- What is the total delay if 1000 bits of data are exchanged during the data transfer phase?
  - What is the total delay if 100,000 bits of data are exchanged during the data transfer phase?
  - What is the total delay if 1,000,000 bits of data are exchanged during the data transfer phase?
  - Find the delay per 1000 bits of data for each of the above cases and compare them. What can you infer?.
- Q 18) Compute CRC-4 character for the following message using a modified 'divisor' constant of 10011.  
1100 0110 1011 01 (LSB on right)