

Indian Institute of Technology Kharagpur
Department of Computer Science and Engineering
IT 30037: Introduction to Internet

Date: 31-08-2018 Class-Test-1 Marks: 20 Time: 1 hr

Roll NO: _____ Name: _____

1. Name the four standard physical topologies used in data networks. (1M)
(i) *Mesh*, (ii) *Star*, (iii) *Bus* and (iv) *Ring*
2. Match the following to one or more layers of the OSI model: (2M)
 - (a) Transmission of bit stream : *Physical layer*
 - (b) Defines frames : *DLC*
 - (c) Reliable process-to-process message delivery : *Transport layer*
 - (d) End-to-end host delivery : *Network layer*
 - (e) Route section : *Network layer*
 - (f) Provides user services such as remote-login and file-transfer : *Application layer*
 - (g) Format and code conversion services : *Presentation layer*
 - (h) Error detection and retransmission : *DLC and Transport layers*
3. Name the four levels of addresses used in internet employed by TCP/IP protocols. Crisply mention their use.(2M)
 - (i) *Physical address: Delivery of information (frame) at a node (hop) over a LAN or WAN.*
 - (ii) *Logical address: End-to-end host delivery*
 - (iii) *Port address: Process-to-process message delivery*
 - (iv) *Specific address: URL (user friendly address)*
4. What is the minimum required bandwidth of a low-pass channel, if we need to send 10 Mbps by using baseband transmission? (1M)
5 Mhz
5. Name the three transmission impairments and suggest their remedies.(3M)
 - (i) *Attenuation: Reduction of power level with transmission distance*
Remidy: Providing the amplifiers at appropriate places for boosting the signal power
 - (ii) *Distortion: Change in signal shape due to differences in delays imposed by different frequency components of the signal.*
Remidy: Using appropriate equalizer, signal distortion can be controlled.
 - (iii) *Noise: Thermal noise, induced noise, crosstalk and impulse noise.*
Remidy: induced and crosstalk can be minimized by using twisted pairs for transmission.
6. Define the channel capacity (with appropriate formulae) in noisy and noiseless cases.(1.5M)
Channel capacity (Noiseless) = $2 \times \text{bandwidth} \times \log_2 L$
Channel capacity (Noisy) = $\text{bandwidth} \times \log_2(1 + SNR)$

7. What are the merits and demerits of AMI signalling scheme.(1.5M)
Merits: Simple, less bandwidth and no DC component.
Demerits: Synchronization problem in case of long sequence of zeros
8. What is scrambling? Name 2 scrambling techniques.(1.5M)
Insertion of transitions in the signal for handling the synchronization problem. Example: In AMI scheme, long sequence of zeros are replaced with signal with some transitions to overcome the synchronization problem at the receiver.
Scrambling techniques: B8ZS, HDB3
9. State Nyquist sampling theorem.(1M)
 $f_s = 2 \times f_m$
 $f_s = \text{sampling frequency,}$
 $f_m = \text{maximum message frequency.}$
10. Show the analog transmitted signals corresponds to BFSK and BPSK schemes for the data 10110.(1M)
11. Draw the constellation diagrams for the following:(1.5M)
 - (a) ASK with peak amplitude values 2 and 4
 - (b) 8-QAM with two different peak amplitude values, 1 and 3, and four different phases.
12. Assume that a voice channel occupies a bandwidth of 4 kHz. We need to multiplex 12 voice channels with guard bands of 500 Hz using FDM. Calculate the required bandwidth. (1M)
Required Bandwidth = $12 \times 4 + 11 \times 0.5 = 53.5 \text{ kHz}$.
13. An FHSS system uses a 5-bit PN sequence. If the bit rate of the PN generator is 64 bits per second, answer the following: (2M)
 - (a) What is the total number of possible hops?
 32
 - (b) What is the time needed to finish a complete cycle of PN?
 2.5 sec