

Computer Facilities and Network Management

BUS3150

Tutorial - Week 13

*** FOR TUTORS ONLY ***

The answers provided here are only brief guides. If you have any comments or suggestions for improvement to this, please let me know so that your improvements may be included in this document.

Objective of this tutorial:

The objective of this tutorial is to strengthen the conceptual understanding of the material covered in the lecture by reflecting on the material in small groups. The tutor will provide feedback to enhance your understanding and diminish misunderstandings, if any.

How to participate in the tutorial:

Form groups of four to five students in each and discuss the answers for the following reflective questions with the group members. After spending about ten minutes for each question, discussing with group members, discuss your solutions with the tutor and other groups. The tutor will provide feedback on your solutions.

Question 1 - Why do Frame Relay networks use bandwidth more efficiently than X.25?

X.25 implements flow and error control between each node in the network. This creates a significant overhead, however it is acceptable for physical links with a high probability of bit error. Frame Relay works with more modern and reliable physical links and therefore does not implement hop-by-hop flow and error control. This reduces overhead and improves bandwidth efficiency.

Question 2 - Name the ATM layers defined by the ITU-T standard and briefly explain their function.

- *ATM Adaption Layer (AAL): accepts transmissions from upper-layer services and maps them into ATM cells. The two parts are the Convergence Sublayer (CS) and the Segmentation and Reassembly (SAR) Sublayer.*
- *ATM Layer: provides routing, traffic management, switching, and multiplexing services.*
- *Physical Layer: cell delineation, bit timing and the physical medium.*

Question 3 - What is the difference between a Virtual Channel and a Virtual Path within an ATM network?

An individual logical connection in ATM is referred to as VCC (Virtual Channel Connection) and a group of VCCs that have the same end points is called a Virtual Path Connection (VPC). A VPC must be established to the required destination node before a VCC. The VPC must have sufficient capacity to support a VCC to the negotiated quality of service.

Question 4 - What is the function of the VCI and VPI in an ATM cell header?

VCI is a Virtual Channel Identifier and VPI is a Virtual Path Identifier. A sequence of VCIs and VPIs in each switch define a VCC and VPC (respectively) through the network. These identifiers are local to each physical connection between two network elements. Therefore the value of the VCI and VPI change as a cell travels from node to node through these physical links in the network.

Question 5 - What is the purpose of Header Error Control (HEC) in an ATM cell?

- *The primary function of the HEC is to check that there are no bit errors in the ATM cells header. For example, if there is a bit error in the VCI or VPI, the cell would not reach its destination and may be routed along an incorrect path through the network. Bit errors in the cells payload (i.e. user data) are dealt with by the end systems, typically in the AAL layer.*
- *A secondary function of the HEC is cell boundary synchronisation. On a cell based physical layer, there is a requirement to find the start of a cell. This may be achieved by evaluating a checksum over 4 octets (32 bits) and comparing it with the fifth octet (the HEC) to see if it matches. If it does match for a number of consecutive cells (i.e. not a freak occurrence), then we may be confident we have found the cell boundary. If it does not match, we can advance one bit interval and try again until we find the match.*

Question 6 - What are the different types of ATM services?

See Week 12 lecture notes slides 31 to 34 inclusive. Also look at AAL.

Also covered during this tutorial is selected multiple choice questions from the sample exam. In order to maximise your use of this tutorial, please attempt all multiple choice questions from the sample exam.

Solutions to the sample exam multiple choice questions.

1. The _____ layer of the OSI model can use the trailer of the frame for error detection.
 - (a) physical
 - (b) *data link*
 - (c) transport
 - (d) presentation
2. When data are transmitted from device A to device B, the header from A's layer 4 is read by B's _____ layer.
 - (a) physical
 - (b) *transport*
 - (c) application
 - (d) none of the above
3. In the OSI model, as a data packet moves from the lower to the upper layers, headers are _____ .
 - (a) added
 - (b) *removed*
 - (c) rearranged
 - (d) modified
4. In a _____ connection, more than two devices can share a single link.
 - (a) point-to-point
 - (b) *multipoint*
 - (c) primary
 - (d) secondary
5. In _____ transmission, the channel capacity is shared by both communicating devices at all times.
 - (a) simplex
 - (b) half-duplex
 - (c) *full-duplex*
 - (d) half-simplex
6. When one of the components of a signal has a frequency of zero, the average amplitude of the signal _____ .
 - (a) is greater than zero
 - (b) is less than zero
 - (c) is zero
 - (d) *a or b*

7. What is the bandwidth of a signal that ranges from 1 MHz to 4 MHz?
- (a) 4 MHz
 - (b) 1 KHz
 - (c) *3 MHz*
 - (d) none of the above
8. The _____ of a composite signal is the difference between the highest and the lowest frequencies contained in that signal.
- (a) frequency
 - (b) period
 - (c) *bandwidth*
 - (d) amplitude
9. PCM is an example of _____ conversion.
- (a) digital-to-digital
 - (b) digital-to-analog
 - (c) analog-to-analog
 - (d) *analog-to-digital*
10. The outer metallic sheath in coaxial cable functions as _____ .
- (a) a connector
 - (b) a second conductor
 - (c) a shield against noise
 - (d) *b and c*
11. In an optical fiber, the inner core is _____ the cladding
- (a) *more dense than*
 - (b) less dense than
 - (c) the same density as
 - (d) another name for
12. Manchester and differential Manchester encoding are both types of _____ encoding.
- (a) unipolar
 - (b) NRZ
 - (c) *biphase*
 - (d) bipolar
13. The minimum bandwidth of Manchester and differential Manchester is _____ that of NRZ.
- (a) *the same as*
 - (b) twice
 - (c) thrice
 - (d) none of the above

14. The data rate is sometimes called the _____ rate.
- (a) baud
 - (b) *bit*
 - (c) signal
 - (d) none of the above
15. _____ addresses on headers change as a packet moves from network to network but the _____ addresses do not.
- (a) Logical; port
 - (b) Logical; network
 - (c) Logical; physical
 - (d) *Physical; logical*
16. A simple parity-check code can detect _____ errors.
- (a) an even-number of
 - (b) two
 - (c) no errors
 - (d) *an odd-number of*
17. Which of the following would not be found in a data message in a bit stuffed protocol like HDLC?
- (a) 1010101010
 - (b) *0111110101*
 - (c) 0000000111
 - (d) 111000011110000
18. In the _____ Protocol, if no acknowledgment for a frame has arrived, we resend all outstanding frames.
- (a) Stop-and-Wait ARQ
 - (b) *Go-Back-N ARQ*
 - (c) Selective-Repeat ARQ
 - (d) none of the above
19. _____ augments the CSMA algorithm to detect collision.
- (a) CSMA/CA
 - (b) *CSMA/CD*
 - (c) either (a) or (b)
 - (d) both (a) and (b)
20. In Go-Back-N ARQ, if frames 4, 5, and 6 are received successfully, the receiver may send an ACK _____ to the sender.
- (a) 5
 - (b) 6
 - (c) *7*
 - (d) any of the above

21. In Stop-and-Wait ARQ, for n information frames sent by the transmitter, the receiver must also respond with the following number of acknowledgements:
- (a) n
 - (b) $2n$
 - (c) $n - 1$
 - (d) $n + 1$
22. The IEEE 802.3 Standard defines _____ CSMA/CD as the access method for first-generation 10-Mbps Ethernet.
- (a) *1-persistent*
 - (b) p-persistent
 - (c) non-persistent
 - (d) none of the above
23. The _____ layer of Ethernet consists of the LLC sublayer and the MAC sublayer.
- (a) *data link*
 - (b) physical
 - (c) network
 - (d) none of the above
24. _____ uses four twisted-pair cables that connect each station to a common hub.
- (a) 10Base5
 - (b) 10Base2
 - (c) *10Base-T*
 - (d) 10Base-F
25. The IEEE 802.11 standard for wireless LANs defines two services: _____ and _____.
- (a) BSS; ASS
 - (b) ESS; SSS
 - (c) *BSS; ESS*
 - (d) BSS; DCF
26. For SNMP, _____ defines the general rules for naming objects, defining object types, and showing how to encode objects and values.
- (a) MIB
 - (b) BER
 - (c) *SMI*
 - (d) none of the above
27. IP is _____ datagram protocol.
- (a) an unreliable
 - (b) a connectionless
 - (c) *both a and b*
 - (d) none of the above

28. The term _____ means that IP provides no error checking or tracking. IP assumes the unreliability of the underlying layers and does its best to get a transmission through to its destination, but with no guarantees.
- (a) reliable delivery
 - (b) connection-oriented delivery
 - (c) *best-effort delivery*
 - (d) none of the above
29. In ATM, a virtual connection is defined by _____ .
- (a) VPI
 - (b) VCI
 - (c) DLCI
 - (d) *a combination of (a) and (b)*
30. In ATM, connection between two endpoints is accomplished through _____ .
- (a) TPs
 - (b) VPs
 - (c) VCs
 - (d) *all of the above*