1. Assume that three routers, U, V and W, have link costs: c(U,V) = 3, c(U,W) = 7 and c(V,W) = 2. Using the Bellman-Ford algorithm, the common routing table for all

routers is:

|  |  |  |  |
| --- | --- | --- | --- |
|  | U | V | W |
| U | 1 | 3 | 5 |
| V | 3 | 1 | 2 |
| W | 5 | 2 | 1. |

* 1. True
  2. False

1. Standard bus type Ethernet links are managed so that collisions are assumed to happen.
   1. True
   2. False
2. Security services include access control, data confidentiality and data integrity, but do not include authentication.
   1. True
   2. False
3. Before the application of the public-key cryptosystem each participant must generate a pair of keys.
   1. True
   2. False
4. A large-scale data center employs a hierarchy of routers and switches. At the top of the hierarchy are the Top of Rack (TOR) switches.
   1. True
   2. False
5. With the use of symmetric encryption, the principal security problem is maintaining the secrecy of the key.
   1. True
   2. False
6. The field of network and Internet security consists of measures to deter, prevent, detect and correct security violations that involve the transmission of information.
   1. True
   2. False
7. Datagram networks require call setup at the network layer.
   1. True
   2. False
8. Information access threats intercept or modify data on behalf of users who should not have access to that data.
   1. True
   2. False
9. Symmetric encryption remains by far the most widely used of the two types of encryption.
   1. True
   2. False
10. SMTP uses handshaking at the application layer whereas HTTP does not.
    1. True
    2. False
11. IPSec provides \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
    1. neither encryption of IP datagram payloads, nor data integrity
    2. no encryption of IP datagram payloads, but does provide data integrity
    3. encryption of IP datagram payloads, but not data integrity
    4. encryption of IP datagram payloads, and data integrity
    5. All of these responses are correct.
12. Which of the following is correct about OSPF?
    1. It is an inter-AS routing approach.
    2. It is used in lower-tier ISPs.
    3. It uses flooding of link-state information.
    4. It runs Dijkstra’s algorithm.
    5. Both C and D are correct responses.
13. What upper layer protocol does the two-byte Frame type field in the Ethernet header correspond to?
    1. IP
    2. TCP/UDP
    3. HTTP
    4. ARP
    5. CSMA
14. A MAC address has length \_\_\_\_\_\_\_\_\_ bits.
    1. 20
    2. 48
    3. 6
    4. 128
    5. None of the responses above are correct.
15. When you login to some page and your Wireshark is running, an extra header is added into client’s HTTP GET message. What is that header?
    1. Authorization: Basic
    2. Accept-Encoding
    3. Accept-Language
    4. None of the responses above are correct.
16. In which of the following protocol headers will you find “*opcode” header*?
    1. HTTP
    2. TCP
    3. ARP
    4. ICMP
    5. All of these responses are correct.
17. Which protocol is not related to the network layer?
    1. ARP
    2. BGP
    3. RIP
    4. ICMP
    5. Both A and C are correct responses.
18. Assume that a University of Windsor student has booted their laptop computer while waiting for a flight in Vancouver, but have not yet connected wirelessly to the free wireless server in the airport. Their intention is to connect to the Computer Science website in Windsor. How many network transactions would be required to obtain a network connection and eventually establish the return of the Computer Science webpage at URL http://cs.uwindsor.ca/ ?
    1. Fewer than 5
    2. More than 5, but less than 15
    3. More than 15, but less than 50
    4. More than 50
19. ICMP does not use ports because \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. ICMP packets are only transmitted between routers and switches
    2. ICMP packets are only transmitted in IP datagrams
    3. ICMP is a network layer protocol and does not use ports
    4. ICMP is an application layer protocol and does not use ports
    5. None of the responses above are correct.
20. Consider sending a 6000 byte datagram into a link that has a maximum transfer size (MTU) of 1000 bytes. How many fragments are generated?
    1. 8
    2. 7
    3. 6
    4. 5
21. If Bob and Alice are two peers and each is located behind a Network Address Translation (NAT) server across a wide-area network (WAN) then, in the absence of application-specific NAT configuration, \_\_\_\_\_\_\_\_\_\_\_ .
    1. they can establish a reliable UDP connection
    2. they cannot establish a SMTP connection
    3. they can establish a TCP connection
    4. they cannot establish a HTTP connection
    5. None of these responses are correct.
22. A \_\_\_\_\_\_\_\_\_\_ attack involves trying every possible key until an intelligible translation of the ciphertext is obtained.
    1. brute-force
    2. Caesar attack
    3. ciphertext only
    4. chosen plaintext
23. Forwarding refers to the manner by which datagrams are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. routed from source to destination ports of end hosts
    2. routed from input to output ports of individual routers
    3. sent from an intended receiver to a third-party destination
    4. routed from source to destination between adjacent routers
24. Random access protocols in shared bus networks use \_\_\_\_\_ to provide “*listen before* *speaking*” and “*stop talking if someone else already is talking*” rules.
    1. CSMA
    2. SMDP
    3. ALOHA
    4. Slotted ALOHA
    5. All of these responses are correct.
25. When 2 or more bits in a data unit have been changed during the transmission, the error is called a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. random error
    2. burst error
    3. inverted error
    4. logical error
    5. None of the responses above is correct.
26. What is the length of the type field frame in Ethernet?
    1. 2 bytes
    2. 4 bytes
    3. 42 bits
    4. 1 byte
27. Assume that four (4) datagrams are received in sequence and are then checked for parity errors. The first datagram bit string contains the 7-bit pattern 1011010, followed by the second datagram pattern 0010111, third datagram pattern 1111110, and fourth datagram pattern 0110011. Each of the bit patterns consists of a leading (leftmost) 6-

bit pattern that is the data payload followed by the rightmost parity bit (parity is defined as 0/1 if the number of 1-bits in the data payload is even/odd). The fourth datagram pattern bits are the parity values of the first three datagram bits in the corresponding positions (taken as a column). The error checking scheme is the two-dimensional parity bit check. Which of the following statements is most correct?

* 1. There is certainly an error in the first datagram
  2. There is certainly an error in the second datagram
  3. There is certainly an error in the third datagram
  4. There is no apparent error, but it is impossible to be fully certain about the data correctness in this case

1. Demultiplexing involves \_\_\_\_\_\_\_\_\_\_\_ .
   1. gathering data from multiple sockets
   2. encapsulating data with a header
   3. delivering received segments to correct sockets
   4. Both A and B are correct responses.
2. Which one of the following is a data link layer protocol?
   1. network news transfer protocol
   2. peer to peer protocol
   3. high level data link control protocol
   4. None of these responses are correct.
3. \_\_\_\_\_\_\_\_\_\_ techniques map plaintext elements (characters, bits) into ciphertext elements.
   1. Transposition
   2. Substitution
   3. Traditional
   4. Symmetric
   5. All of these responses are correct.
4. SSL version 3 is out of date and has been replaced by \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
   1. SSL version 3.1
   2. SSL version 4
   3. Socket Layer Security (SLS)
   4. Transport Layer Security (TLS)
5. What is the largest payload an IPv4 UDP packet can hold?
   1. 65517 bytes
   2. 65535 bytes
   3. 65527 bytes
   4. 65507 bytes
6. In order to deal with the situation where too many sources send too much data too fast for a network to handle, it is necessary to use a technique called \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
   1. Flow control
   2. Congestion control
   3. Routing control
   4. Dynamic packet management
7. Multiple TCP streams can be distinguished on a given machine using \_\_\_\_\_\_\_\_\_\_ .
   1. Ports
   2. IP addresses
   3. network interface cards
   4. routing tables
   5. All of these responses are correct.
8. The \_\_\_\_\_\_\_\_\_\_ attack is the easiest to defend against because the opponent has the least amount of information to work with.
   1. known ciphertext
   2. chosen ciphertext
   3. known plaintext
   4. chosen plaintext
9. An encryption scheme is said to be computationally secure if \_\_\_\_\_\_\_\_\_\_ .
   1. the cost of breaking the cipher exceeds the value of the encrypted information
   2. the time required to break the cipher exceeds the useful lifetime of the information
   3. the amount of time required to break the cipher is greater than the fastest CPUs
   4. Both A and B responses are correct.
10. Consider a packet of length 1024 bytes. Assuming the packet must travel over a link of distance 2500 kilometers with propagation speed 2.5 x 108 m/s and transmission rate 2 Mbps, what is the transmission delay?
    1. approximately 8 millisec
    2. approximately 80 millisec
    3. approximately 200 millisec
    4. approximately 10 microsec
11. Virtual local area networks (VLANs) address the drawback of \_\_\_\_\_\_\_\_\_\_\_ in institutional LANs.
    1. lack of traffic
    2. MAC address management
    3. inefficient use of switches
    4. Both A and C are correct responses.
12. Before the GET command can be sent to an HTTP server, TCP must first set up a connection using which protocol?
    1. Sliding Window Protocol
    2. Point-to-Point Protocol
    3. Three-Way Handshake
    4. One-Bit Sliding Window Protocol
13. What is the protocol number of UDP (in decimal)?
    1. 11
    2. 17
    3. 21
    4. 27
14. Which of the following is not an advantage of UDP?
    1. Transmission reliability
    2. Faster packet transmission rate
    3. Less overhead
    4. Can be used in multicast applications

1. ICMP is an example of a \_\_\_\_\_\_\_\_ layer protocol.
   1. Application
   2. Link
   3. Transport
   4. Network
   5. Physical
2. The header of a frame generally contains \_\_\_\_\_\_\_\_\_\_\_\_\_.
   1. synchronization bytes
   2. addresses
   3. identifier
   4. preamble bytes
   5. The responses A, B and C above are correct.
3. A datagram network provides network-layer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ service.
   1. connectionless
   2. connection
   3. core implementation dependent
   4. None of the responses above is correct.
4. Consider two 16-bit data fields within a message: 1110011001100110 and 1101010101010101. The 16-bit checksum of these two fields is \_\_\_\_\_\_\_\_\_\_\_\_ .
   1. 11011101110111011
   2. 0100010001000011
   3. 1011101110111011
   4. None of the responses above is correct.

Use the following Table for Questions **126, 127 and 128**. The table contains the link costs (in arbitrary units) between routers S, T, U, V, W, X, Y and Z. A dash (hyphen) entry indicates that there is no direct connection between these pairs of routers.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | S | T | U | V | W | X | Y | Z |
| S | 0 | 4 | 4 | - | - | - | - | - |
| T | 4 | 0 | 2 | 4 | - | - | 7 | 6 |
| U | 4 | 2 | 0 | 3 | 3 | - | - | - |
| V | - | 4 | 3 | 0 | 4 | 3 | 1 | - |
| W | - | - | 3 | 4 | 0 | 6 | - | - |
| X | - | - | - | 3 | 6 | 0 | 6 | 18 |
| Y | - | 7 | - | 1 | - | 6 | 0 | 12 |
| Z | - | 6 | - | - | - | 18 | 12 | 0 |

1. Based on the pairwise link costs in the Table above, and using Dijkstra’s algorithm, determine the shortest path route from S to T.
   1. 1
   2. 4
   3. 6
   4. 7
   5. None of these responses are correct.
2. Based on the pairwise link costs in the Table above, and using Dijkstra’s algorithm, determine the shortest path route from X to S.
   1. 16
   2. 10
   3. 8
   4. 11
   5. None of these responses are correct.
3. Based on the pairwise link costs in the Table above, and using Dijkstra’s algorithm, determine the shortest path route cost from X to Z.
   1. 10
   2. 12
   3. 13
   4. 16
   5. None of these responses are correct.