UNIVERSITY OF LIVERPOOL

MOCK EXAMINATION

Computer Networks

TIME ALLOWED : TWO Hours

INSTRUCTIONS TO CANDIDATES

NAME OF CANDIDATE . . . .   SEAT NO . . . .

USUAL SIGNATURE   . . . .

READ THE FOLLOWING CAREFULLY:

1. Each of the following questions comprise 5 statements, for which you should select the one most appropriate answer by placing a tick in the appropriate box.

2. The exam mark is based on the overall number of correctly answered questions. The more questions you answer correctly the higher your mark, incorrectly answered questions do not count against you.

3. Enter your name and examination number IN PENCIL on the computer answer sheet according to the instructions on that sheet.

4. When you have completed this exam paper, read the instructions on the computer answer sheet carefully and transfer your answers from the exam paper. Use a HB pencil to mark the computer answer sheet and if you change your mind be sure to erase the mark you have made. You may then mark the alternative answer.

5. At the end of the examination, be absolutely sure to hand in BOTH this exam paper AND the computer answer sheet.

6. Calculators are NOT permitted.

THIS PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

1. The _____ layer has the primary responsibility for communications between one device and the devices connected to it.

   ☐ **A.** network

   ☐ **B.** physical

   ☐ **C.** transport

   ☐ **D.** link

   ☐ **E.** application

2. A network router joins two _____ together?

   ☐ **A.** computers

   ☐ **B.** networks

   ☐ **C.** switches

   ☐ **D.** gateways

   ☐ **E.** hosts

3. What is the size of an IPv4 address?

   ☐ **A.** 32 bit

   ☐ **B.** 48 bit

   ☐ **C.** 64 bit

   ☐ **D.** 80 bit

   ☐ **E.** 128 bit

4. As a message proceeds down the protocol stack, the destination port number is added at the:

   ☐ **A.** Application Layer

   ☐ **B.** Transport Layer

   ☐ **C.** Network Layer

   ☐ **D.** Data Link Layer

   ☐ **E.** None of the above

5. What is the port number for SMTP?

   ☐ **A.** 21

   ☐ **B.** 25

   ☐ **C.** 65

   ☐ **D.** 70

   ☐ **E.** 80

6. In the DNS structure, the servers responsible for the .uk domain are _____ name servers.

☐ **A.** authoritative

☐ **B.** top level domain

☐ **C.** root

☐ **D.** default

☐ **E.** none of the above

7. Which of the following applications will effectively run on UDP?

☐ **A.** Email

☐ **B.** File transfer

☐ **C.** Web

☐ **D.** Multimedia streaming

☐ **E.** All of the above

8. In a client/server connection using HTTP over TCP, if multiple objects are sent over the same TCP connection, then the connection is classified as:

☐ **A.** Stateless

☐ **B.** Persistant

☐ **C.** Non-persistant

☐ **D.** Stable

☐ **E.** Reliable

9. Consider the Go-Back-N protocol with a sender window size of $N = 4$ and a sequence number range of 1024. Suppose that at time t the next in-order packet that the receiver is expecting has sequence number 228. Assume that the medium does not reorder messages. Which of the following is a possible pair of values for the senders `send_base` and `nextseqnum` pointers at time t?

☐ **A.** `send_base=224;`   `nextseqnum=226`

☐ **B.** `send_base=225;`   `nextseqnum=228`

☐ **C.** `send_base=227;`   `nextseqnum=232`

☐ **D.** `send_base=228;`   `nextseqnum=233`

☐ **E.** `send_base=229;`   `nextseqnum=233`

10. Packet retransmission in TCP is coupled with:

☐ **A.** Flow Control

☐ **B.** Congestion Control

☐ **C.** Connection Management

☐ **D.** All of the above

☐ **E.** None of the above

11. TCP and UDP use the 16-bit Internet Checksum for computing the value of the checksum field in each segment. In this question you are asked to use the same method but for simplicity we restrict to 8-bit words. Suppose you have the following three 8-bit words:

```
11101011
01010101
10110111
```

What is the value of the 8-bit Internet Checksum (i.e., the 1s complement of the 8-bit sum) of these words?

☐ **A.** 00000111

☐ **B.** 00001000

☐ **C.** 00001010

☐ **D.** 00001001

☐ **E.** None of the above

12. Consider a router that interconnects three subnets: X, Y, and Z. Suppose all of the interfaces in each of these subnets are required to have the prefix 13.2.80.0/21. Suppose subnet X is required to support 1000 interfaces, and subnets Y and Z are each required to support 500 interfaces. Which set of network addresses for X,Y and Z satisfies these constraints?

☐ **A.** X: 13.2.80.0/22;   Y: 13.2.82.0/23;   Z: 13.2.84.0/23

☐ **B.** X: 13.2.80.0/22;   Y: 13.2.84.0/23;   Z: 13.2.86.0/23

☐ **C.** X: 13.2.84.0/23;   Y: 13.2.80.0/23;   Z: 13.2.82.0/23

☐ **D.** X: 13.2.88.0/23;   Y: 13.2.84.0/22;   Z: 13.2.80.0/22

☐ **E.** None of the above

13. Given are the following subnet addresses:

      X: `192.168.128.0/22`   Y: `192.168.136.0/22`   Z: `192.168.142.0/22`

Which of the following statements is true?

- ☐ **A.** `192.168.132.1` and `192.168.146.1` are not in the IP range of any of the 3 subnets.
- ☐ **B.** `192.168.132.1` is in the range of X, and `192.168.146.1` is in the range of Z.
- ☐ **C.** `192.168.132.1` is in the range of Y, and `192.168.146.1` is in the range of Z.
- ☐ **D.** `192.168.132.1` is is not in the IP range of any of the 3 subnets, and `192.168.146.1` is in the range of Z.
- ☐ **E.** `192.168.132.1` is in the range of X, and `192.168.146.1` is not in the IP range of any of the 3 subnets.

14. When the speed of the incoming packets at a router exceeds the outgoing link data rate, which of the following may occur?

- ☐ **A.** Transmission delay
- ☐ **B.** Queuing delay
- ☐ **C.** Packet loss
- ☐ **D.** All of the above
- ☐ **E.** None of the above

15. Which of the following MAC protocols is used by Ethernet?

- ☐ **A.** Slotted Aloha
- ☐ **B.** CSMA/CA
- ☐ **C.** CSMA/CD
- ☐ **D.** TDMA
- ☐ **E.** FDMA

16. What are the CRC bits defined by the generator 1101 and the data bit string 111011?

- ☐ **A.** 011
- ☐ **B.** 100
- ☐ **C.** 101
- ☐ **D.** 110
- ☐ **E.** 111

17. What is the signal-to-noise ratio corresponding to 40dB?

☐ **A.** 40

☐ **B.** 400

☐ **C.** 1000

☐ **D.** 4000

☐ **E.** 10000

18. What is the main advantage of first distributing a session key and then using symmetric-key cryptography rather than using public-key cryptography techniques for the whole communication?

☐ **A.** Symmetric-key cryptography is more secure

☐ **B.** Public-key cryptography is more secure

☐ **C.** Public-key cryptography leads to shorter cyphertext

☐ **D.** Symmetric-key cryptography is faster than public-key cryptography

☐ **E.** None of the above

19. Consider RSA with $p = 5$ and $q = 7$. What are the values of n and z?

☐ **A.** $n = 35$ and $z = 24$

☐ **B.** $n = 35$ and $z = 96$

☐ **C.** $n = 119$ and $z = 24$

☐ **D.** $n = 119$ and $z = 96$

☐ **E.** None of the above

20. The AES encryption standard uses the following techniques:

☐ **A.** Block Cypher

☐ **B.** Stream Cypher

☐ **C.** Public key cryptography

☐ **D.** A and B

☐ **E.** All of the above