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Q-No.	Score	Grade
1	5	
2	4	
3	4	
4	4	
5	5	

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Question One: [5 marks] Choose All the Correct Answers

1. Design issues for a Network include:
   a. Reliability
   b. Security
   c. Allocation of resources
   d. one of the above
2. A layer talks to its peer using a service
   a. True
   b. False
3. Acknowledged datagram is regarded as a connectionless service
   a. True
   b. False
4. An implementation of a connectionless service may contain two primitives only
   a. True
   b. False
5. Consider the hybrid 5-layer network model. Which of the following layers may offer the "reliable service"?
   a. The physical layer
   b. The datalink layer
   c. The network layer
   d. The transport layer
   e. None of the above
6. Consider the OSI reference model. Suppose the unit of data exchanged at the data link level is called a frame and the unit of data exchanged at the network level is called a packet. Which of the following (is) are (an) accurate descriptions of the relation between a packet and a frame?
   a. A packet encapsulates a frame
   b. A frame encapsulates a packet
   c. A packet has error detection and/or correction field in its header or trailer but a frame does not.
   d. A frame has error detection and/or correction field in its header or trailer but a packet does not
   e. None of the above
7. Which of the following layer of OSI model also called end-to-end layer?

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    a. Presentation layer
    b. Network layer
    c. Session layer
    d. Transport layer

8. It is possible to calculate 5 redundant bits to correct all single bit errors in a message of size 10 bits
    a. True
    b. False

9. In simplex stop and wait protocol, what can possibly happen if we removed this line "to_physical_layer(&s)" from the receiver code?
    e. ACK drop at the sender side
    f. Packet drop at the receiver side
    g. Both (a) and (b)
    h. None of the above

10. In simplex protocol for a noisy channel, if the channel is assumed to be error free (i.e. no possibility of packet loss or corruption).
    i. No timeout will be needed
    j. No sequence numbers will be needed
    k. No acknowledgements from the receiver will be needed
    l. None of the above.

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Question Two: [4 marks] Answer the following:

The following character encoding is used to send the following character sequence

"HELLO": [H: 01101101 , E: 01000101 , L: 01001100 , O: 01001111]

Knowing that the data link layer uses **character count** as a framing method, and that maximum frame size to be sent in bytes is **Four** bytes, and assuming in order delivery of frames.

      a. Show in binary the bit sequence transmitted, mark the beginning of the frame, and separate bytes from each other's.

      b. State one disadvantage of using the character count as framing method, and give one example to it.

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Question Three: [4 marks] Answer the following:

The following message **11001101** is transmitted using a data link that applies the hamming coding technique with **odd parity** check.
a. What is the hamming distance of the transmitted code words?
b. How many error bits can this technique correct?
c. What is the number of parity bits needed to transmit this message?
d. Show the transmitted bit stream for this message, showing the **steps** of your work and the **bits positions**.

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Question Four: [4 marks] Answer the following:

a. Given a 7-bit message **1101001** and the generator polynomial **G(x) = x^2+1**. Show the full steps to get the transmitted message.

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Question Five: [5 marks] Answer the following:

Iɴ Stop & wait protocol :

a. Why is it enough to have one bit sequence number (numbers 0 and 1)?

b. Can packets that are delayed for a long time cause problems?

c. Why is it necessary to add numbers also to acknowledgement frames? Justify.

d. Assuming a digital data transmission system between Cairo and Alexandria (signal round trip delay about 35 ms) using a T1-line (1536 kbps), and a frame size of 512 Bytes. The overhead can be neglected. What is the total throughput using a stop and wait ARQ protocol?

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