CS425: Computer Networks
Assignment 3

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Sol. 1
Within the IP packet header in the provided capture, the value in the upper layer protocol field is 0x01, which indicates that the upper layer protocol is ICMP (Internet Control Message Protocol).

Sol. 2
In the provided packet capture, the IP header has a length of 20 bytes. To determine the number of bytes in the payload of the IP datagram, we can subtract the IP header length from the total length of the IP datagram.

The total length of the IP datagram is indicated in the IP header as 56 bytes. Subtracting the 20-byte IP header length from the total length, we get:

56 bytes - 20 bytes = 36 bytes

Therefore, the payload of the IP datagram has 36 bytes. We determined this by subtracting the IP header length from the total length of the IP datagram, as indicated in the packet capture.

Sol. 3
Based on the given packet information, there is no indication that the IP datagram has been fragmented. This can be determined by looking at the Fragmentation Offset field in the IP header, which is 0. If the IP datagram had been fragmented, the Fragmentation Offset field would contain a value other than 0, and the More Fragments flag in the Flags field would be set to 1. However, both of these fields are set to 0 in this packet, indicating that the datagram has not been fragmented.

Sol. 4
The value in the Identification field is 0x80b2 (32946 in decimal). The value in the TTL (Time to Live) field is 1.

Sol. 5
Yes, the message corresponding to the above packet has been fragmented. We

can see from the "Info" column in the packet details that the protocol is "Fragmented IP protocol" and the value in the "off" field is non-zero. This indicates that the original IP datagram has been divided into multiple fragments during transmission.

Sol. 6 The identification (ID) field and the fragmentation offset field in the IP header indicate that a datagram has been fragmented. The ID field is a 16-bit value that is used to identify the datagram, and the fragmentation offset field is a 13-bit value that indicates the position of the current fragment relative to the beginning of the original datagram. If the fragmentation offset is non-zero, it indicates that the datagram has been fragmented. Additionally, the More Fragments (MF) flag in the Flags field is set to 1 in all fragments except the last fragment, indicating that more fragments are expected.

Sol7.
The offset field in the IP header indicates whether the current fragment is the first fragment or a later fragment. Specifically, the offset field specifies the offset of the current fragment relative to the beginning of the original unfragmented datagram, measured in 8-byte blocks. The first fragment will have an offset value of 0, while subsequent fragments will have non-zero offset values.

Sol. 8
In the IP header, the "Fragment Offset" field indicates the offset of the current fragment relative to the beginning of the original unfragmented datagram. If this field has a non-zero value, it indicates that the current datagram is not the first fragment.

Sol. 9
Yes, there are more fragments of this datagram. We can tell this by looking at the "Fragment offset" field in the IP header. In this specific packet, the "Fragment offset" field has a value of 1448, which indicates that this is not the first fragment and that there are previous fragments. If a datagram is fragmented, the "More fragments" flag in the IP header is set to 1 in all fragments except the last one, indicating that there are more fragments to follow.

Sol. 10
In the IP header of the second (and subsequent) fragments of a message, the following fields change:
Fragment Offset: The value in the Fragment Offset field indicates the position of the current fragment in the original IP datagram. For the second and subsequent fragments, the value of the Fragment Offset field is set to a value that corresponds to the position of the first byte of data in the fragment relative to the first byte of data in the original datagram.
More Fragments Flag: The More Fragments (MF) flag in the Flags field is set to 1 to indicate that there are more fragments to follow.

Total Length: The Total Length field of the IP header is updated to reflect the length of the current fragment, which may be smaller than the original datagram due to fragmentation.