1. Follows below the header of an *IPv4* Packet carried over an Ethernet (*IEEE 802.3*) frame.

| 0 | 0 | 0 | 0 | 0 | 0 | -32 | -111 | 83 | 46 | -59 | -59 | 8 | 0 | 69 | 0 | 0 | 65 | 105 | -75 | 0 | 0 | 100 | 6 | 107 | -23 | -84 | 17 | 20 | 123 | -84 | 17 | 20 | 123 |

Study it and answer the following:

   a) The Length of the Ethernet header and mark it in the diagram above.
   b) Isolate the IPv4 header from the Ethernet header
   c) Find the hardware address of the source machine
   d) Find the hardware address of the destination node. Does it signify something?
   e) Find the size of the IP payload
   f) Find the source and destination IP addresses
   g) Maximum of how many routers can this IP datagram pass through?
   h) Is this IP datagram a fragment or not? Justify your answer!
   i) What is the value of the identification field?
   j) What is the first byte of the IPv4 header? Justify your answer.
   k) Calculate the value of the header checksum. Please ask me to verify it as soon as your calculation is done. (**I will tell you a secret about it!**)
   l) What do the 13th and 14th bytes (from the left) signify with their values?

2. Below follows an ARP packet. Study it carefully and answer the following with justification

```
ff ff ff ff ff ff 00 21   97 a4 79 b0 08 06 00 01
08 00 06 04 00 01 00 21   97 a4 79 b0 ac 11 0d 50
00 00 00 00 00 00 ac 11   00 01
```

   a) Is it an ARP request or reply? Give two justifications.
   b) What is the data link layer protocol?
   c) Isolate the link layer header bytes from the ARP packet
   d) What is the hardware address of the source?
   e) What is the significance of the 13th and 14th bytes from the left? What do their values signify here?
   f) What do the following bytes signify?
      i. 15th and 16th bytes (from left)
      ii. 17th and 18th bytes
      iii. 19th and 20th bytes
      iv. 21st and 22nd bytes
      v. What is the Network Layer address of the host whose Hardware address is to be resolved?

RESOURCES:

ARP Packet

Hardware Type		Protocol Type	
Hardware length	Protocol length	Operation Request 1, Reply 2	
Sender hardware address (For example, 6 bytes for Ethernet)			
Sender protocol address (For example, 4 bytes for IP)			
Target hardware address (For example, 6 bytes for Ethernet) (It is not filled in a request)			
Target protocol address (For example, 4 bytes for IP)			

IPv4 Header

VER 4 bits	HLEN 4 bits	DS 8 bits		Total length 16 bits	
Identification 16 bits			Flags 3 bits	Fragmentation offset 13 bits	
Time to live 8 bits		Protocol 8 bits	Header checksum 16 bits		
Source IP address					
Destination IP address					
Option					