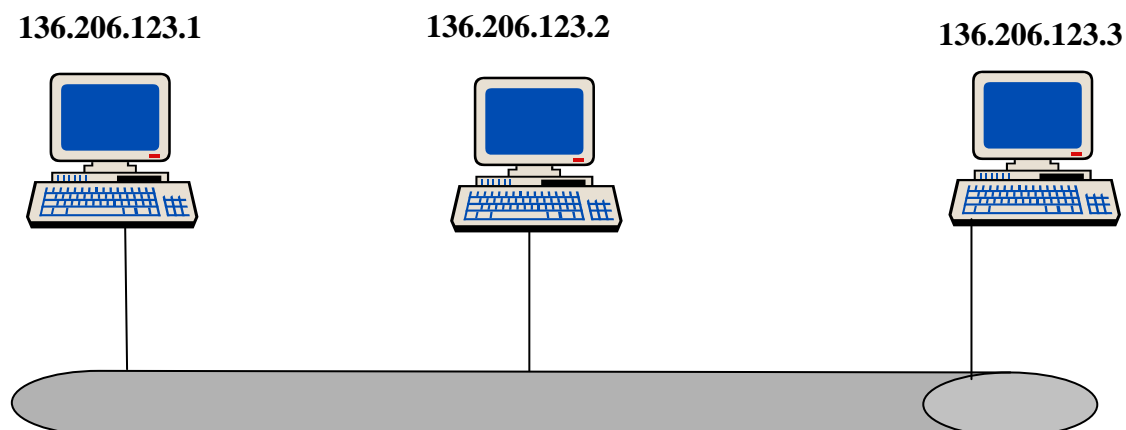


Question

- Q(a) ICMP, the Internet Control Message Protocol fulfils the role of a client protocol in computer networks. Give two instances when ICMP may be used, explain the purpose of the ICMP messages in those instances as you will have seen in the course of your project work and lectures.
- Q(b) Describe the sequence of packets sent (as viewed in *Wireshark*) in the establishment of a TCP connection between two computers that regularly communicate (no lookups to be done). Document only the establishment of the connection. Ignore the termination sequence of events. Pay particular attention to any parameters passed, their values and their interpretation.
Use a diagram to illustrate your answer.
- Q(c) What is the purpose of a DNS and in what circumstances would you have seen its operation in the course of your project.
- Q(d) Assume that the network below has just been powered up, each machine has been just switched on and the IP addresses of each machine are configured as static IP addresses (no DHCP used). In the context of the Address Resolution Protocol (ARP) trace the steps involved in the following sequence of events...
- **136.206.123.1** communicating with **136.206.123.2**
 - **136.206.123.3** communicating with **136.206.123.1**



Question

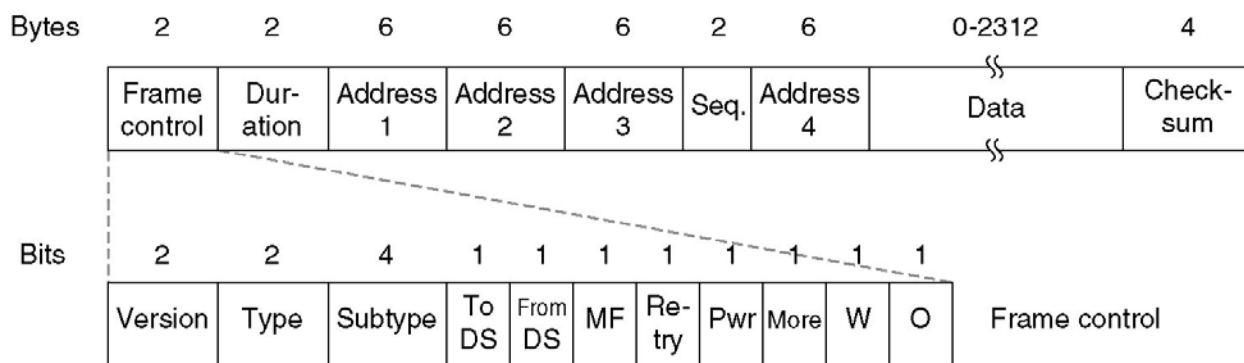
Q(a) In an 802.11 network in Distributed Coordination Function Mode, some computers will have problems communicating with others. These problems are known as the *hidden station problem* and the *exposed station problem*. Explain how these problems arise.

You must use diagrams to illustrate your answer.

Q(b) Describe how the 802.11 Medium Access Control (MAC) protocol, Carrier Sense Multiple Access with Collision Avoidance (CSMA\CA) is utilised to overcome these Hidden Station and Exposed Station problems.

You must use diagrams to illustrate your answer.

Q(c) In the 802.11 frame (below) point out the fields that are used to implement the CSMA\CA scheme used to overcome the hidden station problem and the exposed station problem, stating the values that would be carried in each field and under what conditions.



Question

- Q(a) Draw a diagram of the OSI 7 layer model and briefly explain the function of each of the layers.
Using a diagram, compare the OSI 7 layer model to the 4 layer model of TCP\IP and explain the correspondence between the layers.
- Q(b) Place the following protocols in the correct layer of the OSI 7 layer model and justify your answer, stating the full name of the protocol and name its function.
- HTTP
 - ARP
 - DNS
 - TCP
 - IP
 - Ethernet (802.3)
 - ICMP
 - UDP
 - DHCP
- Q(c) With the aid of a diagram, explain the protocol encapsulation as viewed (using Wireshark) on a computer network when data is being transferred between a web server on a remote machine and a machine in the labs of DCU. In your answer explain the format and function of addressing used for each level of encapsulation.
You will have seen this encapsulation in the course of your project work using Wireshark.

Question

- Q(a) The IP address allocated to DCU is the **Class B** address **136.206.0.0**
- write down this address in CIDR notation
 - explain how you know it is a class B address
- Q(b) A set of sixteen class C addresses, **192.4.16.0** to **192.4.31.0** has been assigned to an organization. Write down a single CIDR address, which encompasses the full address range. Justify your answer.
- Q(c) It is possible that both supernet **205.100.0.0/22** and **205.100.0.0/20** could appear in a router's routing table, and that therefore, the IP address **205.100.1.1** will match both of them. The two CIDR addresses are forwarded on separate interfaces, **205.100.0.0/22** on "*interface 1*" and **205.100.0.0/20** on "*interface 2*" each thus being routed differently.
- Explain why the address **205.100.1.1** matches both supernets.
 - On what interface will an IP packet with destination address **205.100.1.1** be routed and why?
- Q(d) The **non** CIDR, **Class C** address has a subnet **192.168.10.0** and a subnet mask of **255.255.255.224** (i.e. 27 bits used for subnet mask)
- How many subnets on this network?
 - How many hosts per subnet?
 - What are the valid subnets?
 - What is the broadcast address of each subnet?
 - What are the ranges of the valid hosts?

[Total marks: 33]

Question

- Q(a) Explain the simple mathematical cornerstone on which the method of Diffie-Hellman relies (i.e. the discrete logarithm problem). Give a simplified numerical illustration (not the whole Diffie Hellman method).
- Q(b) Explain the simple mathematical cornerstone on which the Public Key Cryptographic method RSA, relies. Give a simplified numerical illustration (not the entire RSA method).
- Q(c) RSA may be used by two parties (each in possession of the others public key) to establish mutual authentication. **With the aid of a diagram**, explain how this may be achieved.

Question

- Q(a) DCU has the IP address 136.206.x.y This is a Class B address; explain why it is Class B and how it is structured.
- Q(b) If the DCU class B address 136.206.x.y were to be represented as a CIDR address, write down the address in CIDR notation.
- Q(c) The IP V4 address space is in crisis. Explain how CIDR and NAT are employed to prolong the life of the IPV4 address space. In your answer refer to the workings of each scheme, the advantages of using them and any shortcomings or problems associated with each. You are expected to use examples of operation **with the aid of diagrams**.
- Q(d) With regard to the *count-to-infinity* problem, explain how it arises within the RIP routing protocol. **Use an example to illustrate your answer**. What change would you make to RIP to avoid this problem.