



**Department of Computer Science**  
**Computer Networks**  
**Due: Sunday 4th October (23.59)**

**Your name:**

TA Name:

Time Taken:

Estimated Time: 6 hours

**This is an individual assignment**

This assignment can be submitted as a pdf using Canvas. For those who like to dabble in the dark arts, the latex version is also available, but you may submit in any legible form you wish. Marks are awarded for question difficulty. While there is typically a relationship between difficulty and length of answer, it may not be a strong one.

**Explain your answer or give full derivation of results where appropriate. Solitary solutions without explanation risk receiving 0 points, even when correct. In particular if there are 2 points for a short question, 1 of them will be for the explanation.**

Optional: Please include a rough estimate of how long it took you do the assignment so that we can calibrate the work being assigned for the course. (The estimated time is provided purely as a guideline.)

|           |   |    |    |       |
|-----------|---|----|----|-------|
| Question: | 1 | 2  | 3  | Total |
| Points:   | 8 | 10 | 12 | 30    |
| Score:    |   |    |    |       |

## IPv4 Subnetting

1 ..... *8 points*

Being able to look at a subnet specification, and list the range of the host IPs is a useful, but rather non-obvious skill to master in networking. It is also quite often used to screen job applicants. The purpose of this question is to help you learn it. The following material may be useful:

<https://www.cisco.com/c/en/us/support/docs/ip/routing-information-protocol-rip/13788-3.html>

(a) (2 points) What is the network mask for a Class D address?

(b) (2 points) What is the network mask for a Class B address?

(c) (2 points) Using Classless Interdomain Routing(CIDR) notation, how many bits are set in the subnet mask of address 192.5.23.132/9

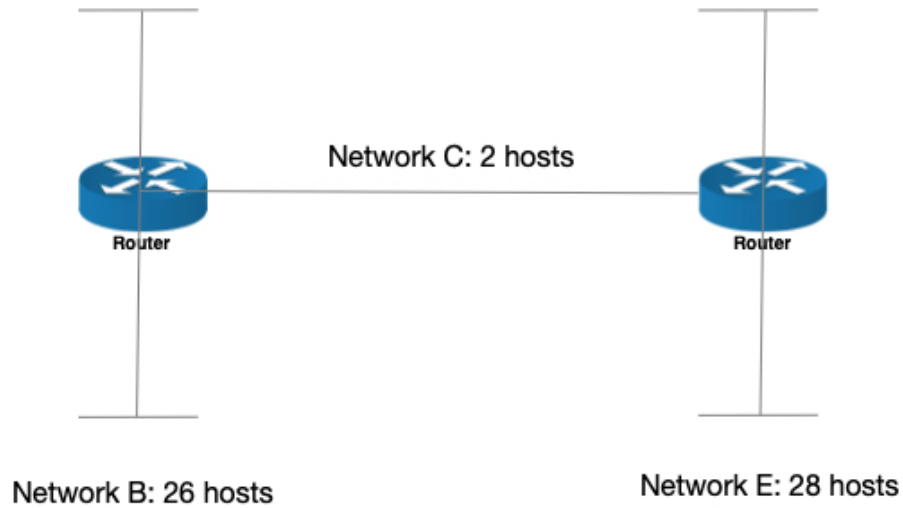
(d) (2 points) How many hosts does this subnet mask provide?

2 ..... 10 points

- (a) (5 points) In the diagram below, subnet the Class C network of 10.5.12.0/24 into 5 subnetworks: List the CIDR and IP ranges of each subnet, and show how many hosts are assigned to each subnet.

**Network A: 3 hosts**

**Network D: 7 hosts**



- (b) (5 points) Variable length subnet masks(VLSM) is a feature on some equipment that allows different length masks to be used for each subnet, and consequently makes allocating address space more efficient.

[https://www.tutorialspoint.com/ipv4/ipv4\\_vlsm.htm](https://www.tutorialspoint.com/ipv4/ipv4_vlsm.htm)

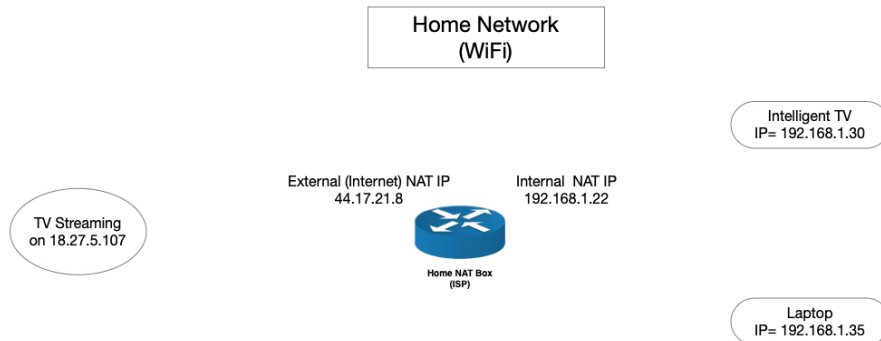
Taking the same network as above, develop a subnetting scheme using VLSM with the following requirements:

- netA Support 16 hosts
- netB Support 2 hosts
- netC support 5 hosts
- netD support 28 hosts
- netE support 15 hosts

Once again, list the CIDR and IP ranges for each subnet, and show how many host IP addresses are available in each subnet.

## Network Address Translation

3 ..... 12 points



The diagram above shows a typical home network setup. The WiFi router which is acting as a NAT for the local network has an Internet IP address of 44.18.21.8, and an internal IP address (behind the NAT) of 192.168.1.22. There is also an Intelligent TV (Local IP 192.168.1.30) and a Laptop (192.168.1.35) also on the home network.

- (a) (4 points) In the diagram a TV is streaming a Movie on its port 8080 from port 54121 on the host providing the Internet TV stream at 18.27.5.107. Set out in a table, for each network port of the **round trip** between the originating host and the destination, what address and port are being used. You may assign port numbers as appropriate where needed.
- (b) (3 points) If the Home NAT Box receives a packet from the Internet, addressed to 133.17.21.8, port 8080, what will it do with it?
- (c) (2 points) If the Laptop makes a broadcast to try and locate a printer, identify the devices that will receive the broadcast.
- (d) (3 points) What is the maximum number of connections a NAT box can support? Why?