**ITEC350 - Homework 1**

**Solutions**

**Question 1**

Radford Corporation has the following class C Internet License:

 193.45.1.0

Radford Corp. would like to allow for at least 9 sub-networks using classful subnetting.

How should Radford Corp. divide up the bits in their Class C license to allow for this?

**193.45.1.0 Network ID Host ID**

**Break the last 8 bits into a Subnet ID and Host ID for 9 subnets using the formula 9 <= 24 – 2 to calculate the number of bits needed for the Subnet ID. The Host ID will use the remainder of the bits available.**

**14 subnets can be created using 4 bits to identify each.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **8 bits** | **●** | **8 bits** | **●** | **8 bits** | **●** | **4 bits** | **4 bits** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

How many devices on each subnet would this allow?

**14 devices would be allowed on each subnet since there are 16 possible combinations of 0’s and 1’s using the 4 available bits but 0000 and 1111 cannot be used.**

**0000 1000**

**0001 1001**

**0010 1010**

**0011 1011**

**0100 1100**

**0101 1101**

**0110 1110**

**0111 1111**

What would their subnet mask be?

**255.255.255.240**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **255** | **●** | **255** | **●** | **255** | **●** | **240** |
| **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** |  | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** |  | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** |  | **1** | **1** | **1** | **1** | **0** | **0** | **0** | **0** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

**The subnet mask identifies the bits used for the Network ID and Subnet ID and the bits used for the Host ID. Since 193.45.1 is the Network ID, the first 24 bits identify the network. The next 4 bits identify the Subnet ID and the last 4 bits identify the Host ID. If the bit is part of the Network ID or Subnet ID it is represented by 1. If it is part of the Host ID it is represented by 0.**

What would be the IP address (Subnet ID) of the first subnet?

**193.45.1.16**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **16** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **0** | **1** | **0** | **0** | **0** | **0** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What would be the IP address of the first machine on the first subnet?

**193.45.1.17**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **17** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **0** | **1** | **0** | **0** | **0** | **1** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What would be the IP address of the last machine on the first subnet?

**193.45.1.30**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **30** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **0** | **1** | **1** | **1** | **1** | **0** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What would be the broadcast address of the first subnet?

**193.45.1.31**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **31** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **0** | **1** | **1** | **1** | **1** | **1** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What would be the IP address (Subnet ID) of the second subnet?

**193.45.1.32**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **32** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **0** | **0** | **0** | **0** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What would be the IP address of the first machine on the second subnet?

**193.45.1.33**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **33** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **0** | **0** | **0** | **1** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What would be the IP address of the last machine on the second subnet?

**193.45.1.46**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **46** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **1** | **0** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What is the broadcast address of the second subnet?

**193.45.1.47**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **47** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **1** | **1** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What would be the IP address (Subnet ID) of the last subnet?

**193.45.1.224**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **224** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **1** | **1** | **1** | **0** | **0** | **0** | **0** | **0** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What would be the IP address of the first machine on the last subnet?

**193.45.1.225**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **225** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **1** | **1** | **1** | **0** | **0** | **0** | **0** | **1** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What would be the IP address of the last machine on the last subnet?

**193.45.1.238**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **238** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **1** | **1** | **1** | **0** | **1** | **1** | **1** | **0** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

What is the broadcast address of the last subnet?

**193.45.1.239**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **193** | **●** | **45** | **●** | **1** | **●** | **239** |
| **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |  | **1** | **1** | **1** | **0** | **1** | **1** | **1** | **1** |
| **Network ID** |  | **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID** |

**Question 2**

RU Corporation has the following class B licence:

 132.45.0.0.

RU Would like to classfully divide this into exactly 62 (sub-) networks.

How should RU Corp divide up the bits in their Class B license to allow for this?

**132.45.0.0 Network ID Host ID**

**Break the last 16 bits into a Subnet ID and Host ID. For 62 subnets use the formula 62 <= 26 – 2 to calculate the number of bits needed for the Subnet ID. The Host ID will use the remainder of the bits available.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **8 bits** | **●** | **8 bits** | **●** | **6 bits** | **2 bits** | **●** | **8 bits** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

How many devices on each subnet would this allow?

**1022 devices on each subnet would be allowed since there are 1024 combinations of 0’s and 1’s using the 10 bits available but 0000000000 and 1111111111 cannot be used.**

**0000000000**

**0000000001**

**0000000010**

 **●●●**

 **●●●**

**1111111110**

**1111111111**

What would their subnet mask be?

**255.255.252.0**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **255** | **●** | **255** | **●** | **252** | **●** | **0** |
| **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** |  | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** |  | **1** | **1** | **1** | **1** | **1** | **1** | **0** | **0** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What would be the IP address (Subnet ID) of the first subnet?

**132.45.4.0**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **4** | **●** | **0** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What would be the IP address of the first machine on the first subnet?

**132.45.4.1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **4** | **●** | **1** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What would be the IP address of the last machine on the first subnet?

**132.45.7.254**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **7** | **●** | **254** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **1** |  | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **0** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What would be the broadcast address of the first subnet?

**132.45.7.255**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **7** | **●** | **255** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **1** |  | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What would be the IP address (Subnet ID) of the second subnet?

**132.45.8.0**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **8** | **●** | **0** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **1** | **0** | **0** | **0** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What would be the IP address of the first machine on the second subnet?

**132.45.8.1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **8** | **●** | **1** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **1** | **0** | **0** | **0** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What would be the IP address of the last machine on the second subnet?

**132.45.11.254**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **11** | **●** | **254** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **1** | **0** | **1** | **1** |  | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **0** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What is the broadcast address of the second subnet?

**132.45.11.255**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **11** | **●** | **255** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **0** | **0** | **0** | **0** | **1** | **0** | **1** | **1** |  | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What would be the IP address (Subnet ID) of the last subnet?

**132.45.248.0**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **248** | **●** | **0** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **1** | **1** | **1** | **1** | **1** | **0** | **0** | **0** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What would be the IP address of the first machine on the last subnet?

**132.45.248.1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **248** | **●** | **1** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **1** | **1** | **1** | **1** | **1** | **0** | **0** | **0** |  | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What would be the IP address of the last machine on the last subnet?

**132.45.251.254**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **251** | **●** | **254** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **1** | **1** | **1** | **1** | **1** | **0** | **1** | **1** |  | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **0** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |

What is the broadcast address of the last subnet?

**132.45.251.255**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **132** | **●** | **45** | **●** | **251** | **●** | **255** |
| **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** |  | **0** | **0** | **1** | **0** | **1** | **1** | **0** | **1** |  | **1** | **1** | **1** | **1** | **1** | **0** | **1** | **1** |  | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** |
| **Network ID** |  | **Network ID** |  | **Subnet ID** | **Host ID (10 bits)** |