Problem 1

In this problem, you will put together much of what you have learned about Internet protocols. Suppose you walk into a room, connect to Ethernet, and want to download a Web page. What are the protocol steps that take place, starting form powering on your PC to getting the Web page? Assume there is nothing in our DNS or browser caches when you power on your PC. Explicitly indicate in your steps how you obtain the IP and MAC addresses of a gateway router.

Write your solution to Problem 1 in this box

When the PC is connected to the Ethernet and tries to access the network, DHCP is used to allocate an IP address to the PC.

HTTP and TCP are needed to transmit and interpret the Web page.

Before any message is sent, we need DNS to get the IP address of web server.

In addition, ARP is need to access link layer address and MAC address.

Problem 2

Suppose there are two ISPs, providing WiFi access in a particular café, with each ISP operating its own AP and having its own IP address block.

(a) Further suppose that by accident, each ISP has configured its AP to operate over channel 11. Will the 802.11 protocol completely break down in this situation? Discuss what happens when two stations, each associated with a different ISP, attempt to transmit at the same time.

(b) Now suppose that one AP operates over Channel 1 and the other over Channel 11. How do your answers change?

Write your solution to Problem 2 in this box

(a) Each AP is connected to its wireless station. Once the connection is built, an AP is still able to receive a frame from the other station, but the AP can't process it.

The ISPs can work in parallel on a shared channel.

When they attempt to transmit at the same time, there will be a collision. Each of ISP has a half bandwidth.

(b) There is no collision. Each ISP may use the full bandwidth.

Problem 3

In Mobile IP, what effect will mobility have on end-to-end delays of datagrams between the source and destination?

Write your solution to Problem 3 in this box

It would cause more delay. Because the datagrams are first routed to home agent and then sent to mobile from the home agent, that would cause more delay than direct routing.

Problem 4

Consider the hierarchical network in Slide 6-84 and suppose that the data center needs to support email and video distribution among other applications. Suppose four racks of servers are reserved for email and four racks are reserved for video. For each of the applications, all four racks must lie below a single tier-2 switch since the tier-2 to tier-1 links do not have sufficient bandwidth to support the intra-application traffic. For the email application, suppose that for 99.9 percent of the time only three racks are used, and that the video application has identical usage patterns.

(a) For what fraction of time does the email application need to use a fourth rack? How about for the video application?

(b) Assuming email usage and video usage are independent, for what fraction of time do (equivalently, what is the probability that) both applications need their fourth rack?

Write your solution to Problem 4 in this box

(a) Both of them use for 0.1% of the time.

(b) 0.001 * 0.001 = 10^(-6)

Problem 5

Answer the following questions:

(a) What is the role of the "core network" in the 3G cellular data architecture?

(b) What is the role of the RNC in the 3G cellular data network architecture?

(c) What role does the RNC play in the cellular voice network?

Write your solution to Problem 5 in this box

(a) It connects radio access network to Internet.

(b) RNC connects to voice network, data network and Internet so that mobile nodes can access voice and data services.

(c) To allocate radio channels.