Isfahan University of Technology
Information Technology Engineering
Dr. Manshaei
Homework 1: Module C.3 Backbone Networks
Deadline: Wednesday 14^{th} **Dey, 1401, at** 23 : 59

We only accept the homework **delivered via (yekta.iut.ac.ir), before the deadline**.

1. Consider the following VLAN switch in our department. Let us assume that a router is connected to port 1.

   (a) Assign IP addresses to the computers in electrical engineering (EE) and computer engineering (CE) groups as well as the router interface.

   (b) Let us assume that one computer in EE group wants to send a packet to a computer in the CE group. Discuss all the steps that should be taken in the network and Link Layer to transmit a datagram from a host in EE group to a host in CE group.

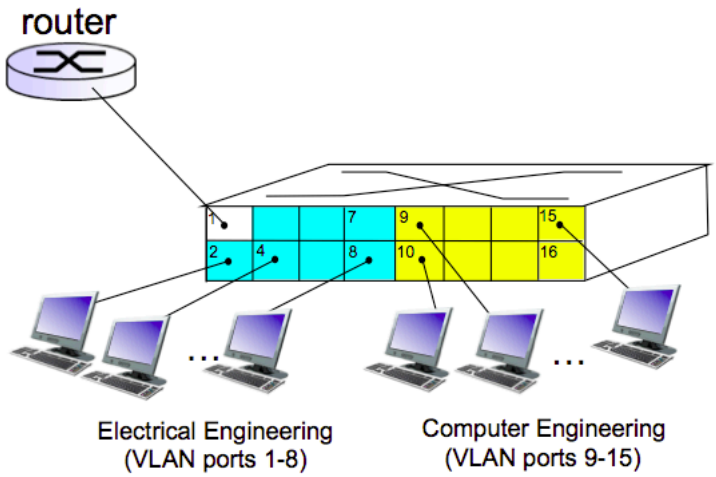

Figure 1: VLAN Plan.

2. How does a router differ from a layer-3 switch?

3. Let us assume that you work in a company as a network administrator. You are asked to implement a network in the company that is placed in an 8-floor building. In each floor, there are 10 offices with 4 to 7 network devices (e.g., computers, network printers, etc.). We would like to separate the traffic of each office from other offices. The company is connected to the Internet; so all traffic should find their route to the Internet. The average data rate needed for each user is supposed to be 8Mbps and the company has limited budget, so you must try to minimize the cost of this project, while considering all constraints.

   (a) Propose a network plan for the wired LAN and Backbone network of this company. Describe different devices (e.g., cables, switches, routers, ...) and the architecture (LAN and BB) of your network and show how it can satisfy the constraints.

   (b) Given the above design, how much Internet bandwidth do you need in order to provide required bandwidth to all users?

   (c) Could you implement a WLAN for this company considering the same constraints for each user (i.e., 8Mbps)? How your architecture in previous question will be changed?

4.Find the data rate of an IEEE 802.11a system, if 16 out of the available 48 subchannels are BPSK- modulated with a rate-1/2 channel code (FEC Rate= $\frac{1}{2}$) and the remaining are 16QAM-modulated with a rate-3/4 channel code (FEC Rate = $\frac{3}{4}$). Note that BPSK transmits one bit in each subchannel and 16QAM transmits 4 bits in each subchannel.

5. Let us assume that you would like to send 01110011 with a wireless node connected to access point of type 802.11b. Explain what would be transmitted given the spread spectrum technique used by 802.11b.

6. **Research Question:** The best WiFi standard is WiFi 6 (IEEE 802.11ax) right now. Explain the main advantages of this standard comparing to previous WiFi standard, such as 802.11g or 802.11n.