ORDRE DES INGÉNIEURS DU QUÉBEC

MAY 2018 SESSION

Open-book examination
Non-programmable calculators : only authorized models
Duration : 3 hours

14-IF-A7 Computer Communications

1) Encode an “A” character (ASCII $41 = 01000001) for an asynchronous serial transmission with 8 data bits, even parity and 1 stop bit. **(10 points)**

2) We consider a radio channel that the spectrum is between 810 and 822 Mhz.
   a. What is the minimum SNR (Signal to Noise Ratio in dB) necessary to obtain a capacity of 96 Mbps for this channel? **(10 points)**
   b. How many signaling levels are required to achieve this limit? **(10 points)**

3) Explain the differences between hub, switch and router. In particular show in a table for these different devices the behavioral differences, the learning mechanisms and the layers of the ISO protocol involved. **(20 points)**

4) We consider a statistical multiplexer that aggregate 256 asynchronous transmission lines (channels) at 115.2 Kbps into a synchronous trunk. The packet format in the trunk is the following:

SYNC	ADDR	DATA	DATA	DATA

Where SYNC is a sync character used to delimit the beginning of the packet; ADDR is the number between 0 and 255 of the asynchronous channel embedded in this packet and DATA are 3 data bytes from the embedded channel. The data format for the asynchronous channel is 8 data bits, one start, no parity and 1 stop bit.

   a. What is the minimum data rate required on the synchronous trunk to ensure that no data are lost even if all asynchronous channels are used at full capacity? **(10 points)**

b. If we consider that the asynchronous channels are used on average at 25% what is then the minimal flow required on the trunk? **(10 points)**

5) We consider the CSMA/CA mechanism involved in wireless LAN or PAN. Show the transmission process sequence with this protocol. The following frames are to be considered and their functions to explain: RTS (request to send), CTS (request to send), Data and ACK (acknowledgment). **(20 points)**

6) Explain why CSMA/CD mechanism can't be used with radio networks. **(10 points)**