



Hands-on Internet of Things Specialization

IoT Communications

Week 1

Question 1:

Refer to this US Frequency allocation chart (use ctrl+F or the find function in your pdf reader to search). You're driving in your car on a long road trip and turn the knob of the FM radio to "95.1". What electromagnetic frequency is your FM radio tuning to?

95.1MHz

Question 2:

Two electrical wires are running parallel and close to one another. If you send electrical current across one wire, you see that you induce current flow in the adjacent wire. What type of field does the first wire's current generate (and that induces current in the adjacent wire)?

Magnetic field

Question 3:

One reason that RF transmitters use low frequencies is that those frequencies are not harmful to humans. Which of the following is another valid reason that RF transmitters may use lower frequencies?

Lower frequencies are easier to generate and manipulate with low-cost circuits.



Hands-on Internet of Things Specialization

IoT Communications

Week 1

Question 4:

You build a typical RF Transmitter that takes digital information and performs modulation, upconversion, and amplification (in that order). What operations will the receiver perform, and in what order?

amplification -> down conversion -> demodulation

Question 5:

The 3 Little Pigs have advanced to the modern age and instead of worrying about wolves blowing down their houses, they want to make sure their houses have good WiFi reception. Wilbur builds his entire house (including indoor walls) out of 203 mm concrete, Bacon builds entire his house out of lumber, and Hamlet builds his entire house out of brick.

Assuming that each pig uses the same house architecture, which pig's house will have the smallest Wifi Signal loss based on their building material?

Bacon

Question 6:

Which of the following is an example when signal attenuation is good?

- **Preventing unauthorized users outside a building from accessing wireless devices inside.**
- **Limiting the range of APs in a dense deployment (to decrease the size of contention zones)**



Hands-on Internet of Things Specialization

IoT Communications

Week 1

Question 7:

Refer to this constellation diagram:



Which property/properties of radio waves are being modulated in this specific modulation?

Phase

Question 8:

Big Corn Incorporated has hired you to deploy a fleet of drones that use image recognition to detect pest infestations and other corn crop metrics at one of its massive corn crops in southern Illinois. As part of your deployment you will construct a base station that relays data from drones to a satellite in low earth orbit.

Which type of antenna is most appropriate for your base station to relay data to the satellite?

Parabolic



Hands-on Internet of Things Specialization

IoT Communications

Week 1

Question 9:

Big Brother Day Care has hired you to construct an IoT platform for tracking the kids. Each child will have a wireless sensor tag taped to their backs which will monitor their behavior and beep if they are doing something naughty. There will be a set of access points deployed across the facility, and wireless transmitters on the devices will send communications wirelessly to them. Which type of antenna is most appropriate for kid tags to communicate to the access points?

Omnidirectional

Question 10:

Sheryl and Andrew set up a transmitter and receiver between their houses so they can talk to each other. The transmitter and receiver have a clear line of sight, but when a tall semi drives between their houses, the semi obstructs some of the signal even though line of sight between the antennae is never broken.

Why are the semis partially obstructing the RF signal?

The semis are entering the Fresnel Zone of the antenna.



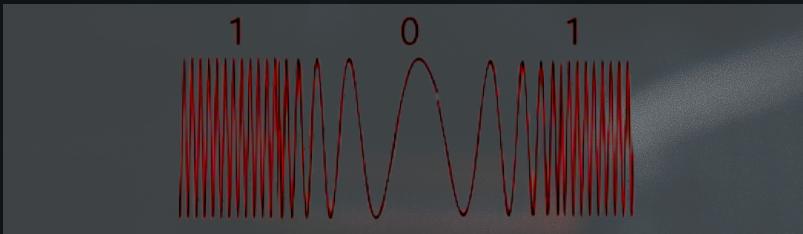
Hands-on Internet of Things Specialization

IoT Communications

Week 1

Question 11:

Consider the modulation scheme used in the following figure:



Which RF modulation scheme is being used in the diagram above?

Frequency Shift Keying (FSK)

Question 12:

What determines the spacing between wires forming the grid of a parabolic antenna (or decision to use a solid material in place of a grid)?

- **Frequency/wavelength of the broadcast signal.**
- **Environmental factors - e.g., having a grid, wind can just blow through.**