1. Consider the GasBuddy application, which displays nearby gas stations for a given location. Assume that GasBuddy automatically updates the location as the user moves, and that it also updates the nearby gas stations. It has **two options** for obtaining location information. **1 point**

The first option: by using GPS, which is more accurate.

The second option: by using the mobile tower-based cellular network, which is far less accurate.

When will GPS sensor give the **wrong** location information?

- (●) It does not give wrong location information, but the information can be stale.
- ( ) It always gives location information within a 20-meter margin of error.
- ( ) It gives wrong location information often because it is unreliable and prone to environmental noise.
- ( ) It gives wrong location information when the temperature is too hot.

2. Consider the GasBuddy application, which displays nearby gas stations for a given location. Assume that GasBuddy automatically updates the location as the user moves, and that it also updates the nearby gas stations. It has **two options** for obtaining location information. **1 point**

The first option: by using GPS, which is more accurate.

The second option: by using the mobile tower-based cellular network, which is far less accurate.

Suppose that there is a GasBuddy user who is driving down a street, and the GPS signal is lost at time t = 0. Also suppose that the average speed of traffic is 5 mph. The error in GPS localization is 40 m (0.024 miles), while the error in mobile tower-based localization is 500 m (0.3 miles). Consider that the location information is requested by GasBuddy every minute.

When should you switch from GPS to cellular?

- (●) Right at t = 0
- ( ) Anytime after 4 minutes
- ( ) Anytime after 7 minutes
- ( ) Stick to GPS

3. Consider a "smart shoe" that has a pedometer to count the number of steps taken by a person. A music app is developed for the smart shoe, which has context-aware functionality: Based on the speed of the person, calculated using the number of steps per second, the app plays a musical piece of matching tempo. For example, if the person is jogging, the app can play music with an upbeat or fast tempo, whereas if the person is walking slowly or resting, the app can play relaxing music with a slow tempo. **1 point**

Can this application be considered "smart"?

- (●) Yes, because it automates the selection of music tempo.
- ( ) No, because it does *not* match the definition of "smart" that is provided in this course.
- ( ) Yes, because it is aware of the step counts.
- ( ) Yes, because it can detect when the person is relaxing.

4. What are some potential and feasible incentives for promoting volunteer computing? *Select all that apply.* **1 point**

- [ ] Free cloud computing time
- [ ] Promise of availability of other user's personal information
- [ ] Promise of fast application execution
- [x] Promise of peer-to-peer computing advantages

5. Edge computing devices are required for IoT applications because… **1 point**

- ( ) they are always connected to the main power supply.
- (●) they have multiple modes of communication.
- ( ) they have high computation power.
- ( ) they can recharge sensors.

6. What are the advantages of fog servers over cloud servers? *Select all that apply.* **1 point**

- [ ] It is never advantageous to use fog servers over cloud servers; fog servers are only used to test applications.
- [x] Fog servers tend to be more available than cloud servers

- [ ] Fog servers have pre-trained machine learning models that can be accessed faster than the cloud servers.
- [x] Communication to fog servers is faster than to cloud servers.

7. Suppose that you at a football stadium, and you are using Facebook Live to stream a football match so your friends can watch. However, due to limited bandwidth in your area, the quality of the video is very poor, and the sound is not in sync with the video frames. **1 point**

Which optimizations will make Facebook Live an application-aware adaptation? *Select all that apply.*

- [ ] The application chooses the user with the best video feed and the user with the best audio feed and combines the feeds to generate a new video.
- [x] The application predicts when there will be breaks in the football game so the stream can have high audio quality during break times and high video quality during game time.
- [x] The application uses the location information to detect that the user is watching a football game, then predicts that the user is most interested in not only posting the video feed but also giving proof that the user was watching the game, so the application sacrifices the sound for higher video quality and insets the front camera feed on the stream to show the user's reactions to the game.
- [ ] The application has a functionality to manually tag the user's friends.

8. Consider a movie recommendation system, where based on the movie you are watching currently, it predicts what movie you will like best. What kind of adaptation is this? **1 point**

- (•) Proactive
- ( ) Reactive

9. What is User level adaptation? **1 point**

- ( ) Where adaptation decision is taken by pervasively incorporating user preferences.
- ( ) When the developer adapts the requirements to match the updated needs of the user.
- (•) Where every adaptation decision is verified with the user.
- ( ) Where the adaptation decision is static and irrespective of user preferences.

10. Consider two types of sensor for a blood glucose monitoring system: **1 point**

a) glucosemeter, which is more accurate but less frequent (3 times a day)

b) Continuous Glucose Monitor (CGM), which is less accurate than glucosemeter but more frequent (every 5 min data).

Consider that you are developing an application that attempts to identify hypoglycemia (blood glucose level < 54 mg/dL). WHen a hypoglycemia occurs you need to immediately let the person know so that the person can quickly eat something to prevent serious potentially fatal risks.

Which sensor should you use?

- ( ) Don't use a sensor, just ask the person how they feel.
- ( ) CGM
- (•) Use CGM for primary detection but verify with glucosemeter.
- ( ) Glucosemeter