1. Apple 3D Touch was a touchscreen technology that could detect where and how hard a finger touched the screen, with three levels of pressure: soft, medium, hard. 3D Touch has recently been replaced by Haptic Touch, which only differentiates between a short and long press on the touchscreen, ignoring finger pressure entirely.

   (a) Discuss why Haptic Touch may be more usable than 3D Touch for a touchscreen user interface. You may wish to consider sensor-based interaction challenges in your answer.

   [6]

   (b) How could touch duration (i.e., short vs long) or pressure (i.e., soft vs hard) be used to make it easier for users to interact with a touchscreen whilst walking?

   [4]

2. A travel company would like to develop a remote virtual reality tourism application, so that potential customers can experience travel destinations before booking and before travelling to their chosen destination.

   (a) They would like to provide 360-degree panoramic images and videos of hotels and landmarks, to help customers choose an appealing destination. Identify the device and tracking requirements that are needed for this functionality to be available to as many people as possible. Justify your choice and explain the implications of these tracking requirements on availability.

   [6]

   (b) Discuss three factors that might have a negative impact on a person's sense of presence when viewing 360-degree panoramic images and videos. You may wish to consider your tracking requirements from the previous part of the question.

   [6]

   (c) The travel company wants to provide customers with a VR headset preloaded with their virtual tourism application, so they can familiarise themselves with their destination whilst flying. Identify challenging elements of this usage context and discuss how they might negatively impact interaction with the virtual experience.

   [8]

3. In a research paper published in 2005, Antti Oulasvirta and colleagues reported that mobile phone users interact in short bursts of around 4-8 seconds long, because their attention is "fragmented". This research and its findings predate the release of the first smartphone.

    (a) Consider the features and capabilities of a modern smartphone. Do you think user attention in a mobile interaction scenario is likely to be more or less fragmented than in 2005? Or do you think the results are unlikely to have changed? Write a short essay to justify your opinion.

[10]

    (b) In this paper, it was found that the shortest interaction bursts and most attention switches occurred when users were on a busy street. Speech user interfaces in modern smartphones could make it easier for users to interact whilst walking on a busy street. However, why might speech not be a suitable replacement for touchscreen input while on the move? Discuss your reasoning.

[10]

4. You have been hired to develop a smartphone app that helps tourists find restaurants in Glasgow. Users should be able to view nearby restaurants and their menus.

    (a) Restaurant information and menus could be stored locally on the smartphone or remotely on a web service. Discuss the advantages of each option.

[6]

    (b) A key feature of the app will be to recommend restaurants that are within walking distance and give directions to them. Discuss the potential negative effects of location ambiguity on this feature.

[2]

    (c) Your employer wants to add a feature that allows users to publicly review restaurants and share photos of their meal, to receive a discount on their meal. Identify one privacy or safety concern with this feature and discuss how you could design the app to address this concern.

[2]