

Departamento de Informática

Mestrado em Engenharia Informática

Exame 1ª Chamada – Sistemas de Computação Móvel e Ubíqua

2º Semestre, 2010/2011

CLOSED BOOK. Duration: **2 hours**

NAME: _____ **NUMBER:** _____

IMPORTANT: Read the text carefully before answering.

Question 1 – Regarding mobile computing as a computer systems discipline...

a) Discuss the main driving forces (motivations) behind the emergence of mobile computing and what makes mobile computing different from computer systems in general.

b) Which new challenges are specific to mobile computing compared to traditional systems? Explain.

Question 2 – By definition, mobile systems are expected to change position/location...

a) What is the technical difference between position and location?

b) Triangulation is one of the principles that can be used to compute the position of a device and is the basis for GPS (Global Positioning System). Provide a short explanation of how GPS works, and discuss its main shortcomings.

c) A-GPS (Assisted GPS) is an (optional) add-on that can help improve the performance of GPS devices. What kind of assistance is provided and by whom?

d) In space, a (moving) probe/vessel can also use triangulation to determine the position. In this case, the basic technique exploited is *angulation*, using well-known bright stars as reference points. *Lateration* is not as feasible, why not?

Question 3 – Mobile computing can benefit from context-aware computing features...

a) What is context-aware computing and why is it particularly suited to mobile settings?

b) Give two examples of context-aware computing as the means to enhance mobile applications.

c) List examples of sources of information that can be tapped to drive context-aware systems in a mobile application.

Question 4 – Wireless sensor networks (WSNs) are an example manifestation of pervasive computing...

- a) One important trend observed in WSNs is to have devices that do not run a full operating system. What does this mean and why is it so?
- b) WSNs often require acquired data to be routed to a given sink base station in a multi-hop fashion. In the context of WSNs, what is multi-hop routing and what are the main challenges involved?

Question 5 – Bluetooth is a standard for wireless communication oriented towards the creation of personal area networks. Its main design characteristics are in agreement with that goal. Explain (criticize) these statements.

Question 6 – Enhancing applications by taking advantage of cloud-based services is an important architectural trend that has emerged recently...

- a) Explain why mobile computing is specifically compatible with the above idea.
- b) Provide up to three examples of mobile application scenarios with clear benefits from cloud-based services.

Question 8 – Participatory Sensing (P/S) is a recent advent in ubiquitous mobile computing...

- a) Explain what is Participatory Sensing, and what are its main motivation/goals, advantages and drawbacks.
- b) Monitoring road traffic in metropolitan areas is often touted as a paradigmatic application that can be developed around Participatory Sensing principles. This scenario can, however, be tackled in two rather different ways: one focusing on monitoring what *is currently happening*, as opposed to monitoring what *usually happens* on a road network. Which of the two is easier to address and why? Explain.
- c) Consider the PotHole Patrol system, which is implemented on top of the CarTel infrastructure, and, also leverages the opportunistic communications sub-system that allows collected data to be disseminated information based on assigned priorities. Discuss whether this communication infrastructure is essential for the purpose of PotHole Patrol, possibly arguing in favor of an alternative.