



RAJARATA UNIVERSITY OF SRI LANKA  
FACULTY OF APPLIED SCIENCES

B.Sc. (Four Year) Degree in Information and Communication Technology  
Fourth Year - Semester I Examination – Oct. /Nov. 2017

ICT 4204 – MOBILE COMPUTING

Time: Two (2) hours

**INSTRUCTIONS TO CANDIDATES:**

1. This paper consists of FOUR (4) questions in 4 pages.
  2. Answer ALL questions.
  3. Start answering each main question on a new page.
  4. Maximum marks attainable for the paper is 100.
  5. The maximum attainable mark for each question is given in brackets.
  6. This examination accounts for 60% of the module assessment.
  7. This is an **open book** examination.
  8. Assume reasonable values for any data not given in or with the examination paper. Clearly state such assumptions made on the script.
  9. In case of any doubt as to the interpretation of the wording of a question, make suitable assumptions and clearly state them on the script.
  10. This paper should be answered only in English.
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**Q1. Mobile Networks [25 marks]**

- a) Briefly explain the idea of hidden terminal problem and a possible approach to minimize the effect of hidden terminal problem. [5 marks]
- b) Fixed channel allocation, channel borrowing and dynamic channel allocation are three channel allocation strategies used in cellular networks. Explain why channel borrowing is considered as a tradeoff between other two approaches. [5 marks]
- c) Briefly explain how local anchoring results in reduced search cost and increased update cost compared to pointer forwarding. [5 marks]
- d) Briefly explain how Mobile IP(v6) secures binding update messages. [5 marks]
- e) Compare Mobile IP(v6) and Hierarchical Mobile IP considering two major factors and explain how Hierarchical Mobile IP can support fast handoff. [5 marks]

**Q2. Ad-Hoc and Sensor Networks [20 marks]**

- a) Briefly explain two application areas of ad-hoc networks. [5 marks]
- b) Developing routing protocols for sensor networks is a unique challenge due to the characteristics such as dynamic topology, resource constraints and event driven nature of the communication.
  - i. Compare and contrast reactive routing and proactive routing considering two main factors. [5 marks]
  - ii. Compare and contrast Dynamic Source Routing and Ad Hoc On-Demand Distance Vector Routing (AODV) considering two main factors. [5 marks]
  - iii. Briefly explain how Zone Routing Protocol combines the good qualities of both reactive and proactive routing protocols. [5 marks]



**Q3. Pervasive Computing and Mobile Cloud Computing [25 marks]**

- a) Briefly explain two (2) main advantages of mobile cloud computing using suitable example applications. [5 marks]
- b) You are hired to design a photo management mobile application. The proposed design for the photo manager application should consider following requirements and concerns.
- The application will be used by the users to take, enhance and share photos.
  - The users will be able to view the photos of their friends and comment on them, add tags to them, and process them using the application.
  - Enhancing and processing the photos will require running complex filtering algorithms on the photos, which might require heavy resources.
  - The application should have capabilities such as automatic face recognition and automatic tagging of users in the photos.
  - Due to storage limitations of the devices, it may not be desirable to keep copies of all the photos locally in the mobile device.
  - The application might have to cache or pre-fetch photos to provide better user experience in weak connectivity areas.

Some tasks such as enhancing of photos will require heavy computing resources and might require support from mobile-cloud computing systems. In mobile cloud computing, the computing can be offloaded in a static or dynamic manner.

- i. Compare and contrast the static code offloading and dynamic code offloading approaches. [5 marks]
- ii. If you are asked to use the static offloading approach, which functions of the photo manager application will be executed locally and which parts will be offloaded to the Cloud? Justify your selection. [5 marks]
- iii. If you are asked to use the dynamic offloading approach, what are the offloading decisions that will be taken dynamically and what will be the main factors that would affect the offloading decision? Justify your selection. [5 marks]
- iv. Briefly explain how cloudlets can help in such an application to provide better user experience. [5 marks]



**Q4. Mobile Application Development and Context Awareness [30 marks]**

- a) Smartphone applications can be categorized as native mobile applications, mobile web applications and hybrid applications. For each of the following scenarios, **explain what type of application will be more suitable and give reasons for your selection.**

[2 x 5 marks]

- i. A mobile application that would allow public to report traffic violations with proofs (videos, photos, etc.).
  - ii. A sports news application that will allow users to get updates about sporting actions happening around the world.
- b) In android, the Dalvik virtual machine was replaced with android runtime (ART) from Android 5.0. Compare and contrast the android runtime (ART) and the Dalvik virtual machine.
- [5 marks]
- c) You are required to develop a context-aware news aggregator application that will combine news from various sources, which is targeted to attract Sri Lankan mobile users. You should consider that the users have interests in diverse areas like politics, sports, general news, foreign news, etc. In addition, users may have preferences over which type of contents (video, text, etc.) they would like to see.
- i. Identify the main context aware features/functions that should be supported by the application.
  - ii. Identify the relevant contextual information required to support the features identified in part (i).
  - iii. Identify the sensing approaches for capturing the context information identified in part (ii).
- [5 marks]

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