RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (Four-Year) Degree in Information and Communication Technology
Fourth Year - Semester I Examination – June / July 2018

ICT 4204 – MOBILE COMPUTING

Time: Two (2) hours

INSTRUCTIONS TO CANDIDATES:

1. This paper consists of FOUR (**4**) questions in **5** 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.

Q1. Mobile Networks [22 *marks*]

a) Briefly explain how 802.11e MAC protocol can support service differentiation. [4 *marks*]

b) *Mobile IP(v6) uses return routability procedure to secure binding updates. Briefly explain* how return routability procedure secures binding updates. [6 *marks*]

c) Briefly explain the location management approach of cellular networks highlighting important entities and operations. [6 *marks*]

d) A cellular network operator has realized that the demand is very high during office hours in all the cells in the Colombo area and in some cells the demand frequently exceeds the capacity of the cell. Briefly explain two possible approaches that can be used to increase the capacity of these cells (in this scenario) without adding new channels to the network. [6 *marks*]

Q2. Ad-Hoc and Sensor Networks [24 *marks*]

a) Ad Hoc On-Demand Distance Vector Routing (AODV) protocol is a table driven reactive routing protocol.

   i. AODV uses destination sequence number to eliminate the use of old routs and to prevent forming of routing loops. Briefly explain how destination sequence number guarantees these characteristics in AODV protocol. [6 *marks*]

   ii. AODV uses a timeout value to get rid of unused/old paths. Briefly explain how the value assigned to timeout parameter will affect the routing protocol. [6 *marks*]

b) Briefly explain how Zone Routing Protocol combines the good qualities of both reactive and proactive routing protocols. [6 *marks*]

c) You are required to develop a wildlife monitoring system using a sensor network. The sensor network is required to track the movement of a group of elephants using the sounds they make. You are considering whether to use Dynamic Source Routing (DSR) or Destination-Sequenced Distance Vector (DSDV) routing as the routing protocol.

   i. Briefly explain one advantage of DSR over DSDV for this application. [3 *marks*]

   ii. Briefly explain one advantage of DSDV over DSR for this application. [3 *marks*]

Q3. Pervasive Computing and Mobile Cloud Computing [30 *marks*]

a) Computation offloading can be done in many ways. Briefly explain the difference between virtualization and mobile agent approaches used for computation offloading giving one advantage of each approach. [6 *marks*]

b) You are hired to design a mobile learner support application. The proposed design for the learner support application should consider following requirements and concerns.

- The learner support application should be able to act as the client application of the learning management system (Moodle) and make the contents in Moodle available for the learner. The contents should be made available for a user when he is online as well as offline. However, storing all the contents in the mobile application will not be suitable due to the space limitations of some mobile devices.
- The learner support application should allow the learner to manage his time efficiently by allowing the user to maintain a calendar and giving reminders and suggestions to the user about the tasks and deadlines. The context of the learner should be considered in giving suggestions. The deadlines for assignments and other academic events may be available in the learning management system (Moodle).
- The learner support application should allow the users to save the audio of the lectures and automatically generate text transcripts for the recorded audio contents.
- Some learners might have difficulties in understanding the lectures delivered in English and would prefer to get real-time or offline translation of lecture contents from English to Sinhala/Tamil. However, the availability of real-time translation will depend on availability of computing resources.
- The learner support application should allow the users to do the programing and other assignments within the application and submit them to the learning management system (Moodle). The application might use locally installed applications or online programing tools and other hosted applications to generate the submissions.

i. Some tasks such as translation of audio contents 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. If you

are asked to use the static offloading approach, which functions of the learner support application will be executed locally and which parts will be offloaded to the Cloud? Justify your selection. [6 *marks*]

ii. 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 decisions? Justify your selection. [6 *marks*]

iii. Briefly explain how cloudlets can help in such an application to provide better user experience by providing computing power. [6 *marks*]

iv. Explain how service discovery middleware can help in the implementation of such an application. [6 *marks*]

Q4. Mobile Application Development and Context Awareness [24 *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.**

[3 x 4 *marks*]

i. A research reference management mobile application that would allow researchers to organize, read, annotate and share research publications.

ii. An e-book reader application that will allow users to purchase, download and read e-books. However, the reader application should prevent unauthorized sharing of the e-books.

iii. A public transit assistant application that will allow users to search for possible public transit options to reach a destination.

b) 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. [6 *marks*]

ii. Identify the relevant contextual information required to support the features identified in part (i). [6 *marks*]

--- *End of the Paper* ---