RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES, MIHINTALE

B.Sc. Four Year Degree in Information and Communication Technology
Forth Year – Semester I Examination – April/May 2015

ICT 4202 - MOBILE COMPUTING

ADDITIONAL MATERIAL: *None*

INSTRUCTIONS TO CANDIDATES:

1. This paper consists of FOUR **(4)** questions in **5** pages.
2. Duration of the exam is two (2) hours.
3. Answer ALL questions.
4. All questions carry equal marks. Marks allocated for each section of the question is indicated in brackets.
5. This examination accounts for 60% of the module assessment.
6. This is a closed book examination.

   NB: It is an offence to be in possession of unauthorized material during the examination.

7. Assume reasonable values for any data not given in or with the examination paper. Clearly state such assumptions made on the script.
8. 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.
9. This paper should be answered only in English.

1.

a) In the basic operation of carrier sense multiple access (CSMA) medium access control (MAC) protocols, a node will sense the carrier before a transmission and data is transmitted only if the channel is idle. If the channel is busy, the node will wait for a random time and retry. This may cause the hidden terminal problem.

i. Explain what is meant by the hidden terminal problem. [3 *marks*]

ii. Explain a solution used to solve this problem. Your discussion should include how the proposed solution eliminates/reduces the problem. [5 *marks*]

iii. Briefly explain what is meant by the exposed terminal problem. [3 *marks*]

b) Enhanced distributed channel access (EDCA) of IEEE 801.11e MAC supports service differentiation.

i. Explain what is meant by service differentiation. [2 *marks*]

ii. Explain how the service differentiation is achieved in IEEE 801.11e MAC. [3 *marks*]

iii. Why is this feature important for mobile computing? [5 *marks*]

c) Briefly explain two (2) applications of wireless sensor networks. [4 *marks*]

[25 *marks*]

2.

Context awareness is an extension of adaptation in mobile computing systems.

a)

Explain what is meant by the term "context" in mobile computing systems. [5 *marks*]

b) What is meant by the term "context awareness" in mobile computing systems? Give a suitable example for context aware behavior. [4 *marks*]

c) Briefly explain the four (4) core capabilities that should be there in a context aware system. [8 *marks*]

d) What is the difference between hard sensing and soft sensing in context aware systems? [4 *marks*]

e) List one (1) advantage and one disadvantage (1) of each of the following context representation techniques.

i. Ontologies
ii. Fuzzy logic

[2x2 *marks*]

[25 *marks*]

3.

Location management and handoff management are the two main tasks of a location management scheme of a mobile computing system.

a) Briefly explain the concept of location management. [3 *marks*]

b) Briefly explain the role of following entities with respect to location management in Mobile IPv4.

i. Home Agent
ii. Foreign Agent

[2x3 *marks*]

c) Briefly explain the role of following entities with respect to location management in Proxy Mobile IPv6.

i. Mobile Access Gateway (MAG)
ii. Local Mobility Anchor

[2x3 *marks*]

d) Briefly explain the operation of following optimizations applied to the location management in cellular concept.

i. Pointer Forwarding
ii. Local Anchoring

[2x3 *marks*]

e) Soft handoff and hard handoff are two handoff mechanisms used in cellular networks. Briefly explain the difference between the two approaches.

[4 *marks*]

[25 *marks*]

4.

a) Latency of mobile data access can be reduced using mobile data caching. However, compared to caching in traditional distributed systems, caching in mobile computing systems is more challenging.

i. Compare and contrast the caching in traditional distributed systems with caching in mobile computing systems considering the following aspects. [6 *marks*]

- Bandwidth/latency
- Cost of a cache miss
- Reasons for data invalidation

ii. Briefly explain two (2) classes of cache invalidation mechanisms employed in mobile computing systems. [6 *marks*]

b) The architecture of the Android mobile platform is shown below (Figure Q4).

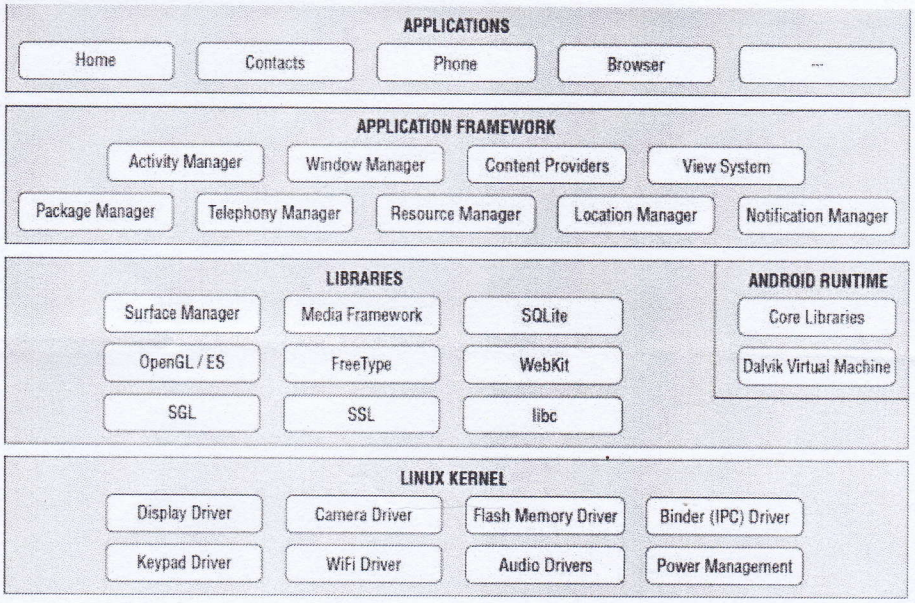

Figure Q4: The Architecture of the Android Mobile Platform

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Briefly explain the following components of the architecture highlighting their capabilities, roles, importance, and important features.

i. Core Libraries

ii. Dalvik Virtual Machine

iii. Activity Manager

iv. SQLite

[4x2 *marks*]

c) Explain the role of importance hierarchy in the lifecycle of an android application. [5 *marks*]

[25 *marks*]