MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2012/2013

THIRD YEAR SECOND SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE
(HOMA BAY CAMPUS)

CCS 310: MOBILE COMPUTING

Date: 28th July, 2013   Time: 8.00 – 10.00 a.m.

<u>INSTRUCTIONS:</u>

♦ Answer Question ONE and any other TWO questions.

QUESTION ONE (30 Marks)

a) Mobile computing systems can be charaterised in terms of the following. Explain the meaning of each terminology, highlighting the impact of each on the salient feautures of mobile compters: Location awareness, Limited device capabilities, Power supply constraints, Support for a wide variety of user interfaces, and Platform proliferation. **[5 mks]**

b) With the aid of a sketch of Speed (bandwidth) against Mobility range, explain the how the following technologies have contributed to the mobile computing landscape: PANs, WLANs, 2-G Cellular, 2.5-G Cellular, 3-G Cellular and LTE. **[5 mks]**

c) Bluetooth is a popular personal area networking protocol that has become an integral part of modern mobile computing devices.
   i) With the aid of a sketch describe the Bluetooth protocol stack. **[4 mks]**
   ii) Explain, with the aid of a diagram, the features of Bluetooth FHSS modulation technique, citing its advantage. **[3 mks]**
      1) What is the meaning of Time Division Duplexing as far as Bluetooth is concerned? **[1 mks]**
      2) A Bluetooth packet has dwell time of 625 ms. Determine the hopping frequency. **[2 mks]**

d) Describe, using a simple illustration, the multiple path problem in cellular networks. What factors contribute to this problem and how is the effect of the problem minimized in mobile communication systems? **[4 mks]**

e) Explain the salient features of processors used in mobile devices and hence describe the architecural components of a typical mobile processor such as ARM Cortex A9. **[6 mks]**

QUESTION TWO (20 Marks)

a) Describe, withe the aid of a flow chart, 802.11 wireless LAN CSMA/CA algorithm. Hence explain the following **[6 mks]**
   i) The difference between DCF and PCF? **[2 mks]**
   ii) How RTS, CTS and ACK are used to avoid hidden station and exposed station problems in 802.11 networks. **[6 mks]**

b) Draw the frame format of an 802.11 frame and explain how it differs from 802.3 frame. **[2 mks]**

c) The mobile host H1 in the diagram below is sending a packet to the Internet via the AP and Router R1. Draw the frames involved in the operation illustrating the addressing mechanisms between H1 and the AP and the AP and the router. [10 mks]

802.11 Frame: Addressing
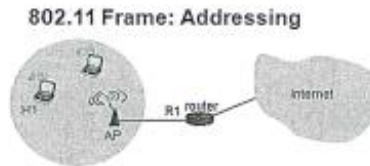
QUESTION THREE (20 Marks)

a) Describe the components of the Architectural and Functional features of the GSM cellular system, with specific emphasis on how each component contributes to mobility. Use a suitably labeled diagram. [5 mks]

b) With regards to GSM, explain
   i) Factors that may be used to determine the number of mobile users in a given BSS. [2 mks]
   ii) How dynamic power control is achieved [2mks]

c) Draw a typical GSM frame, and explain the role of the various fields on the operation of the system. [3 mks]
   Draw the GSM frame hierarchy, from time slot to hyper frame, hence determine the data rates for [2 mks]
   i) Each slot, given that the duration for each slot is 0.577 ms. [3 mks]
   ii) A GSM frame of duration 4.615 ms. [3 mks]

QUESTION FOUR (20 Marks)

a) With the aid of a diagram, describe the the major components of a mobile
   computing platform.   [4 mks]
b) Describe the basic features of mobile middleware, explaining how these
   features support mobile computing applications.   [5 mks]
c) Describe, with the aid of a diagram, the Wireless Application Protocol
   (WAP) architecture, highlighting how the protocols map onto the OSI model
   layers.   [8 mks]
d) Describe the basic features of the WAP programming model.   [3 mks]

QUESTION FIVE (20 Marks)

a) Describe, with the aid of an illustrated sketch, the mechanism of IETF
   Mobile IP and explain the mobility challenge it addresses.   [6 mks]
b) Explain the role of mobile agents in mobile IP networks. Draw the frame for
   Agent advertisement in mobile IP and time/space diagram to explain how
   registration takes place.   [8 mks]
c) Discuss the problems of deploying mobile IP in modern TCP/IP computer
   networks.   [6 mks]