ICT 9025
Mobile Applications and Technologies
Test 1 (Marking Guide), Version A
[November 2021]

Full Name: **Student ID:**

Instructions
Answer *all* the questions
Mark allocation is indicated [in square brackets] on the right side of the questions
Duration: 1 hour 20 minutes
Total Marks: 35

Note:
ICT 9025 Test 1 Version A was displayed (online) to students whose student ID number ends with 1,2,3,4 or 5
ICT 9025 Test 1 Version B was displayed (online) to students whose student ID number ends with 6,7,8 or 9 **and** all students who wrote the test online but not on Moodle

Q2, Q5, Q7, Q9 and **Q14** are different for Version A and Version B, however, these questions are still **similar** in Version A and Version B. All other questions are the exact-same for both Version A and Version B.
ICT 9025 Test 1 Make-up had no Version B (there was only one version for those who wrote the Make-up test)

1) Give the difference between Ubiquitous Computing and Mobile Computing [2]

Answer
Ubiquitous computing is whereby users have the ability to access computer services and resources all the time in any location, while mobile computing is whereby users use mobile computing devices which move with the user
**Explaining ubiquitous computing [1]*
**Explaining mobile computing in your own words [1] or explaining mobile computing with the notes exactly [0.5]*
**Note, grammar also factored in (in multiple questions)*

2) Give the maximum data rate, in megabytes per second, that Bluetooth 2.0 can support [2]

Answer
0.375 MB/s

*(3 Mbps (megabits per second) which equals 0.375 MB/s (**megabytes** per second)*
(Divide the Mbps by 8 to convert Mbps to MBps, i.e. 3/8 = 0.375 MB/s)
**MB/s answer [2 marks given]*
**Mbps answer [0.5 marks given]*

3) Explain the difference between GSM and EDGE [4]

Answer

**Also depends on explanation given*

EDGE is an upgrade of GSM with modifications to provide faster data speeds [2]

(note, in addition to being an upgrade/extension of GSM, faster speeds should be mentioned)

GSM is a circuit switched 2G network, EDGE is a packet-switched 2.75 G (or 2.5 G) network [2]

May also receive marks from explaining what GSM is. GSM is a global standard for mobile communication, usually including the use of cellular phones [1]

4) Explain what makes GPRS faster than GSM [2]

Answer

**Also depends on explanation given*

GPRS being packet-switched includes better support for data services and IP-based data transmission. GPRS includes a direct connection to the Internet, additionally; users can 'make calls and send data simultaneously. [2]

**may also receive marks for mentioning of TDMA time-slots: with GPRS multiple timeslots can be allocated to the same user, with GSM one timeslot is allocated to a user by default (although GSM with HSCSD has 3 time slots per user) [1]*

5) What is the difference between 3GPP and 3GPP2 [2]

Answer

**Also depends on explanation given*

3GPP is a group (or project) that released the WCDMA/UMTS 3G standard whereas 3GPP2 is a group that released the CDMA2000 standard

6) Explain how CDMA2000 has better spectral efficiency than WCDMA [2]

Answer

**Also depends on explanation given*

Spectral efficiency is the amount of data that can be transmitted per second by users connected to the network. CDMA2000 has more frequency ranges than WCDMA which allows more users and more data transfer simultaneously over the network. [2]

**mention that CDMA2000 has more frequency ranges than WCDMA [0.5 marks], (see table in Lecture 3 slide 34)*

7) Give one advantage that WiMAX has compared to CDMA2000 [2]

Answer

**Also depends on explanation given*

WiMax can provide higher throughput and bandwidth than CDMA2000 (i.e. WiMax has faster data transfer speeds) [2]

(marks also awarded for mentioning that WiMax is generally regarded as 4G standard (competing with LTE) whereas CDMA2000 is regarded as a 3G standard mainly competing with UMTS/WCDMA)

8) Regarding cellular networks:
   a. Give the similarities and differences between SMS and MMS [4]
   b. Explain how MMS messages are sent to legacy devices (non MMS capable devices) [2]

Answer

**Also depends on explanation given*

a)

*differences

Type of content: SMS transmits plain text whereas MMS can transmit images, video and audio.

SMS has a maximum length of 160 characters whereas MMS has a maximum length of 1600 characters (modern phones using MMS can send up to 600KB of data)

MMS usually costs more than SMS

*similarities:

MMS developed using the same technology as SMS

Both transmitted over the same mobile networks

b)

An MMS message will be forwarded to the receiver's MMSC (Multimedia Messaging Service Centre) The MMSC first determines if the receiver's device can receive MMS before delivering the content. If the receiver's handset is not MMS capable, the message can be delivered in a web-based format whereby the content can be viewed in an internet browser.

9) Regarding GSM: explain the difference between VLR and HLR [2]

Answer

**Also depends on explanation given*

HLR contains information on every subscriber within a mobile network. VLR stores data on active mobile stations or roaming mobile stations in a given area, VLR does include some data from the HLR, although data in the VLR is usually more dynamic as it is based on mobile stations moving between different areas.

10) Regarding GSM:
    a. Explain what the LMSI is [1]
    b. Which database allocates LMSI data [1]

Answer

**Also depends on explanation given*

Local Mobile Station Identity, a temporary identification number assigned to a mobile station that visits another network that is not is home network

VLR allocates LMSI data

11) List 2 security concerns of mobile computing and indicate how GSM mitigates those security concerns [2]

Answer

**Also depends on explanation given*

Concerns:

Availability; ensuring authorized users get the access they require. GSM mitigates this with having various cells/ base transceiver stations (and connecting to other GSM networks in other regions) to cover a wide area of GSM access, including a seamless handover process where necessary [1]

Integrity; ensuring unauthorized modification of information does not take place, GSM utilizes a SIM based system mitigate unauthorized users accessing or modifying information, only the sender and receiver will have access to the information transmitted

Note: mention how GSM mitigates the security concerns (how GSM reduces or avoids these security problems/ concerns)

12) Give two differences between a BTS and a Node-B [2]

Answer

**Also depends on explanation given*

BTS works with 2G networks while Node-B works with 3G networks

Node B includes additional 3G equipment which a BTS does not need to include

13) Regarding GPRS: briefly explain what the GMSC does [2]

Answer

**Also depends on explanation given*

GMSC connects a mobile station to calls coming from another network such as the telephone PSTN network (e.g. calls involving a landline phone and a mobile station/cellular phone)

14) Suppose a CDMA Base Station has the chip sequence 00101
Give the code that would be transmitted to represent the data 1011. [3]

Answer

From the data 1011, replace every 1 with 00101 (the chip sequence), replace every zero with the complement of 00101 which will be 11010

The code from 1011 = **00101 11010 00101 00101**

Total: [35 marks]