

ICT 9025: Mobile Applications and Technologies
Test 1 (Partial-Solutions)
[May 2022]

Instructions

Answer *all* the questions

Mark allocation is indicated [in square brackets] on the right side of the questions

Duration: 1 hour

Total Marks: 32

Write your answers in the answer sheets provided (ensure that your name and student ID are written at the top of each answer sheet submitted)

- 1) Regarding Pervasive Computing:
- a. Give the difference between Ubiquitous Computing and Pervasive Computing [4]
 - b. Give an example of one device that uses Pervasive Computing [1]

a - Ubiquitous Computing is whereby users can access computer services and resources all the time in any location, **wherever the user goes, there is a computer that they can use**. While Pervasive Computing involves **embedding computational capability (using microprocessors) into everyday objects**

b – Smart Refrigerator, Smart Stove, Smart Watch, etc.
including laptops, smartphones, tablets, sensors.

(Note: more information on pervasive computing:

<https://www.techtarget.com/iotagenda/definition/pervasive-computing-ubiquitous-computing>)

- 2) Give three differences between Mobile Networks and Wired Networks [3]

Wired Networks

- high bandwidth
- low bandwidth variability
- high power machines
- high resource machines
- need physical access(security)
- low delay
- more consistent connection

Mobile Networks

- low bandwidth
- high bandwidth variability
- low power machines
- low resource machines
- need proximity
- higher delay
- less consistent connection

- 3) Regarding a GSM network's MS and BTS, give the difference between uplink and downlink [2]
- Uplink – transmission of data/information received by the base station, transmitted from the phone
- Downlink – transmission of data received by the phone, transmitted from the base station

- 4) GSM networks in USA utilized the 1900 MHz frequency band, give two other frequency bands that GSM networks utilized (*in Europe and other regions*) [2]

GSM 900
GSM 1800

Additionally:

GSM 450

GSM 750

GSM 810 (one mark for stating GSM 800)

- 5) Explain two advantages and two disadvantages of GSM [4]

Advantages

Facilitates Mobile communication
High capacity
Worldwide connectivity
High transmission quality

Disadvantages

Patented Technologies limiting availability
Limited data rate capability
Electronic Interference can affect connectivity

- 6) Regarding GSM networks, give the full name of the abbreviation TDMA and explain how TDMA is used in a GSM network [3]

Time Division Multiple Access

GSM utilizes an **eight-time slot** TDMA method, such that up to 8 users can share the same frequency. Each user uses the frequency for a fraction of a time-frame (known as a time slot) and the **time-frame** begins again after each of the 8 users have used the frequency in a given time-slot

- 7) Regarding the GSM NSS: explain any 3 components within the NSS [6]

AUC, HLR, VLR, MSC, EIR **

AUC - protects user identity and authentication of data transmission

HLR – database which stores all user-relevant information, static and dynamic user information

VLR – database with locations of active MS, updates when MS leaves or enters an area

MSC – controls setting up calls and handoff, connects the MSC to other MSCs and BSCs

EIR – database which contains all IMEIs registered to a network, includes three lists (blacklist, whitelist, and grey list) for network devices

- 8) Explain two types of BTS antennae and for each type give an example of a location where it would be utilized [2]
omnidirectional antennae and directional antennae
(See Lecture 02 slides 31 to 32 for more information)
- 9) Regarding SIM card smart chips: besides the CPU, give 3 components of a smart chip and explain the functionality for each of the 3 components given. [3]
RAM, ROM, EEPROM
VCC, GND, CLK, RESET, I/O
(See Lecture 02 slide 52 for more information)
- 10) Regarding the SMS-GMSC:
- a. Explain the functionality of the SMS-GMSC [1]
 - b. Besides the SMS-GMSC, explain one other component of an SMS network [1]
- a) The SMS-GMSC is a **gateway** component which sends messages from a **GSM MSC** to an **SMSC** and vice versa
- b) **SME – Short Messaging Entity**, the source and recipient devices for SMS messages
SMSC – SMS Center, receives and forwards SMS messages to the intended destination/ recipient device

Total: [32 marks]