

UNIVERSITY OF RUHUNA

Faculty of Engineering

Mid-Semester 8 Examination in Engineering: November 2014

Module Number: EE8247

Module Name: Wireless and Mobile Communications

[2 Hours]

[Answer all questions, each question carries five marks]

Q1. For each question below, there may be one or several correct answers. You get 1 point if you mark a correct answer. You also get 1 point if you leave the wrong answer unmarked. Otherwise you get 0 points. There are 9 questions and 30 answers in this part. You don't get any point if you mark all 30 answers as correct, or leave all 30 answers unmarked. Mark an answer as correct by filling in the check-box with an 'X' or leave it blank unselect a wrong answer.

Please attache the answered paper (page no.1 and page no.2) to your answer script.
[5 Marks]

a) Which protocol(s) listed below is/are used in the GPRS core network for a CS (Circuit Switched) domain?

- SS7 (Signaling System #7)
- IP (Internet Protocol)
- TCP

b) When GSM is upgraded to GPRS by introducing SGSN (Serving GPRS Support Node) and GGSN (Gateway GPRS Support Node) nodes, which entity/entities in the radio access network listed below is/are affected?

- HLR (Home Location Register)
- BS (Base Station)
- MT (Mobile Terminal)
- EIR(Equipment Identifying register)

c) Which one of the following entities in GPRS is the gateway to the Internet?

- SGSN
- GGSN
- GMSC

- d) Which statement(s) listed below is/are correct with respect to bandwidth occupancy per channel for each mobile system/wireless network?
- GSM – 200 KHz
 - IEEE 802.11b – 22 MHz
 - UMTS – 3.84 MHz
- e) Which of the technique(s) listed below could be used for network planning of a cellular Network ?
- Erlang B Formula
 - Traffic Pattern Analysis and Prediction
 - Shannon Channel Capacity
 - Radar equation
- f) Which of the statement(s) below is/are correct with respect to mobile/wireless networks and corresponding MAC mechanism(s) used.
- GSM – CDMA (Code Division Multiple Access)
 - UMTS – both CDMA (Code Division Multiple Access) and TDD (Time Division Duplex)
 - IEEE 802.11 WLAN – CSMA/CD (Carrier Sensing Multiple Access / Collision Detection)
- g) Which of the delay component(s) listed below should be included in the end-to-end delay calculation of a mobile service?
- Propagation delay
 - Queuing delay
 - Transmission delay
 - Processing delay
- h) Which of the following units are used correctly for the given parameter in digital wireless systems?
- Channel capacity – Hz (Hertz)
 - Bandwidth – bps (bits per second)
 - Link data rate – bps
- i) Which statement(s) listed below is/are correct regarding GSM
- Paging channel is used only in downlink.
 - Random Access channel is used only in uplink.
 - Dedicated signal channel is used in both uplink and downlink.

- Q2 a) Figure Q2 depicts the GSM communication system. Explain the process of initiation of a mobile terminated call which is generated from outside PSTN (Public Switching Telephone Network).

[2 Marks]

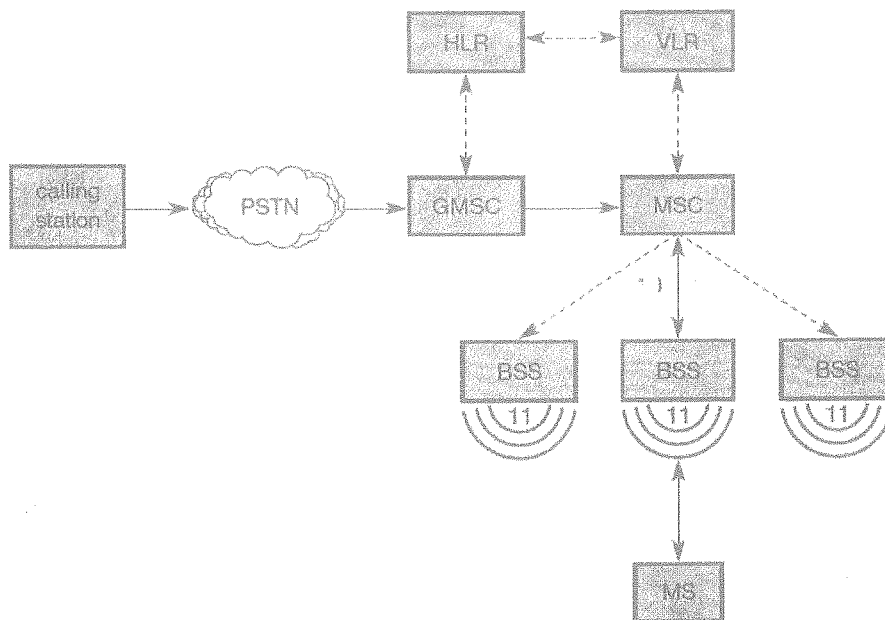


Figure Q2: GSM communication system

- b) A radio cell is defined by 1 base station and a certain number of mobile stations. The radio frequency is in the 1800 MHz band. (Use 1800 MHz for both uplink and downlink for propagation calculations) The antenna on the base station is an antenna array with an antenna gain of 16 dBi. The transmitter power of the base station is 10W. The mobile station has an antenna gain of 0 dBi, and the transmitter power is 2W. The receiver sensitivity of the mobile units and the base station is -90 dBm, and the system is dimensioned with a fading margin on 30 dB. What is the theoretical physical range of the radio cell which support for duplex communication?

[3 Marks]

- Q3 a) Explain the process of Authentication of a mobile user in a GSM network

[1 Mark]

- b) Figure Q3 depicts the format of the data burst used in GSM. Explain the functions of each segment

[2 Marks]

TB 3	Encrypted bits 57	flag 1	Training sequence 26	flag 1	Encrypted bits 57	TB 3	GP 8.25
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Figure Q3: Data burst

- c) I. What limits the number of simultaneous users in a TDMA or FDMA system compared to a CDMA system?

[1 Mark]

II. What happens to the transmission quality of connections if the load gets higher in a cell and how does an additional user affects the other users in the cell in each of the system? [1 Mark]

Q4 a) What is the main difference between handover and roaming? [1 Mark]

b) Describe two reasons for handover. [1 Mark]

c) What are the four types of handovers used in GSM? [1 Mark]

d) I. How many time slots are there in a GSM TDMA frame? How long does a GSM TDMA frame last? [1 Mark]

II. How do we get the conclusion that the channel data rate in GSM is 270.833 Kbps? [1 Mark]