



UNIVERSITY OF RUHUNA

Faculty of Engineering

Mid-Semester 8 Examination in Engineering: October 2015

Module Number: EE8258

Module Name: Telecommunication Networks

[Two Hours]

[Answer all questions. Q1 carries 12 marks. Q2, Q3 and Q4 carries 6 marks each]

Note: Use the following abbreviations.

ADSL : Asymmetric Digital Subscriber Line
BSC : Base Station Controller
BTS : Base Transceiver Station
DSL : Digital Subscriber Line
GSM : Global System for Mobile Communications
HLR : Home Location Register
ISDN : Integrated Services Digital Network
MSC : Mobile Switching Centre
POTN : Plain Old Telephone Network
PSTN : Public Switch Telephone Network
RNC : Radio Access Network
VLR : Visitor Location Register

- Q1 a) i) Draw a block diagram to illustrate the main elements of a GSM network.
ii) Identify the main interfaces of part a) i).
iii) Briefly describe the functions of BTS, BSC and HLR in a GSM network.
iv) Categorize channel types of a GSM network as traffic channels and control channels.

[6 Marks]

- b) A 2G subscriber is in an area covered by cell A of BTS A. The mobile is switched off initially and the subscriber should switch on the mobile to make a call. Assume that the subscriber moves from cell A to cell B of BTS B while making the call. The BTS A and the BTS B are connected to the same BSC (and also to MSC/VLR).

- i) Identify the steps of mobile station initialization after switching on the mobile station.
ii) Describe the frequency synchronization process of the call.
iii) Summarize the steps of the handover when the subscriber moves from cell A to cell B.

[6 Marks]

- Q2 a) i) Draw a block diagram to illustrate the main elements of a PSTN.
ii) Briefly describe the process of a handset from the off hook to the call setup. [2 Marks]
- b) i) Draw a block diagram to illustrate elements of an ISDN customer premises equipment by indicating the interfaces clearly.
ii) Compare and contrast POTN and DSL architectures.
iii) Illustrate the bandwidth of a local loop enabled ADSL technology [4 Marks]
- Q3 a) State three main advantages of using fiber optics as communication links. [1 Mark]
- b) Identify the main components of a commercial fiber optic cable. [1 Mark]
- c) Compare and contrast the single mode fiber with the two types of multimode fibers based on the refractive index, the ray path, the input and the output. [2 Marks]
- d) i) Define the term "acceptance angle".
ii) Using the Snell's law, derive an expression for the acceptance angle.
Hint: The refractive index of air is equal to one. [2 Marks]
- Q4 a) Draw a block diagram to illustrate the main elements of a 3G network. [1 Mark]
- b) Identify the main interfaces in part a). [2 Marks]
- c) What is the Iur interface of a 3G network? [1 Mark]
- d) Briefly describe the functions of NodeB and RNC. [2 Marks]