

EXAMINATIONS 2013 / 2014 **AHOLIADAU 2013 / 2014**

Semester 1

FACULTY OF: APPLIED DESIGN AND ENGINEERING
SCHOOL OF APPLIED COMPUTING

NAME OF COURSE/PROGRAMME: MSc. Computer Networks

YEAR OR LEVEL: 7

NAME OF MODULE/UNIT/EXAM PAPER: Emerging Network Technologies

MODULE NO: M7X00667

DATE OF EXAMINATION:

EXAMINATION TIMES:

START TIME:

FINISH TIME:

TIME ALLOWED: 2 hours

INSTRUCTIONS TO CANDIDATES:

Answer three out of four questions. Each question carries equal marks.

Only basic calculators are permitted. Scientific calculators especially with internal memories are not allowed.

Candidates are not permitted to bring dictionaries; text books/case studies or any other reference materials into the exam room.

QUESTION ONE

- a) Construct and label a VoIP connection through the LAN and explain its operation and functionalities.
(5 Marks)
- b) Assume congestion in the VoIP LAN, reconstruct and label the network, including an option to divert the voice data over the PSTN. Explain why it is important for a corporate business that employs VoIP over the packet switching network to also have PSTN exist in parallel.
(10 marks)
- c) An IP packet containing the voice payload has an IP header that is 40 bytes. The IP packet contains the voice payload which varies in size based on the codec type, its bit rate and codec packetization period (code sample interval). The codec used is G.711 with bit rate of 64 kbps and sample interval of 20 milliseconds (ms). Calculate the following:
a. Voice payload size
b. The length of the voice packet
c. Call transmission capacity
(4 marks)
- d) Can TCP/IP use for real-time continuous speech? State your reasoning and explain the most suitable combination transport protocol that can be used.
(6 marks)

QUESTION TWO

- a) What is WiMAX?
(2 marks)
- b) Explain three types of antennas used by WiMAX and state what situation they suited for.
(8 marks)
- c) A newly form Internet Provider company, employed you as their Network specialist. You are asked by the company Manager to propose which network is suitable for the backbone, between WLAN and WiMAX. Write the proposal describing both networks. Recommend and give reasons which network would be better suitable for the company network backbone.
(15 marks)

QUESTION THREE

a) Explain LTE and LTE advanced (LTE-A).

(9 marks)

b) What do you understand by channel reuse in cellular networks?

(4 marks)

c) Consider figure 1 below with a single high-power transmitter which provides a radio communication service to a city with total bandwidth available is 25MHz and each user requires 30 KHz of bandwidth for voice communication.

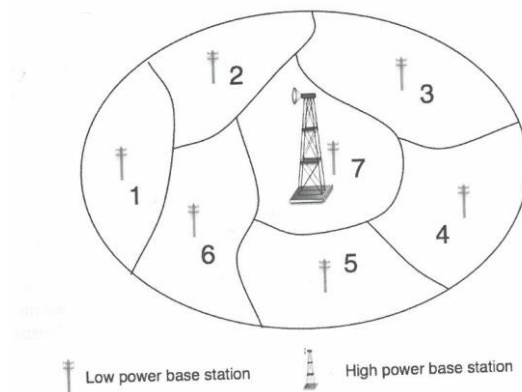


FIGURE 1

- i. If one antenna is use to cover the entire city,
 1. How many users can be supported simultaneously?
- ii. If the city is split into hexagonal cells with seven cells per cluster
 1. How much allocated spectrum each cell has?
 2. Hence, how many users can each cell supported?
- iii. If a cellular topology was employed where 20 lower power antennas are opportunisticly located to minimize both kinds of interference co-channel and adjacent:
 1. Now, what is the total number of simultaneous users?

Note that the number of users supported simultaneously (capacity) can be calculated using the formula: $n = \frac{k(\frac{S}{N})}{W}$ Where S is the total spectrum, W is the bandwidth needed per user, N is the cluster size, and k is the number of cells required to cover a given area.
(12 marks)

QUESTION FOUR

- a) Describe three types of multiplexing; you should include their advantages and disadvantages.
(9 marks)
- b) What is cognitive radio? Describe its architecture and state some of its challenges and issues.
(10 marks)
- c) Explain the difference between contention-based and contention-free protocols.
(6 marks)