One hour - on line

The exam will be taken on line.
This is the paper format, which will be available as a backup
and to be handed out to students for reference immediately AFTER the examination starts

Please do NOT use the exam paper to write your answers

UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE

Digital Wireless Communication and Networks

Date: Friday 27th May 2011
Time: 14:00 - 15:00

Please answer any TWO Questions from the THREE questions provided

For full marks your answers should be concise as well as accurate.
Marks will be awarded for reasoning and method as well as being correct.

This is a CLOSED book examination

The use of electronic calculators is permitted provided they are
not programmable and do not store text.

[PTO]
1. For each of the network layers (a-e), giving example protocols where appropriate, briefly discuss differences between protocols used in peer-to-peer ad-hoc and access point controlled wireless networks.

In parts a-e), 13 marks are allocated for your answers, 7 additional marks are for use of appropriate examples protocols giving a total of 20 marks.

a) Physical (2 marks)

b) Data-link (2 marks)

c) Network (4 marks)

d) Transport (3 marks)

e) Application (2 marks)

2. Two mobile IEEE 802.11g equipped devices are exchanging data using 54Mbps as the nominal data rate.

a) What is meant by 54Mbps as used by IEEE 802.11g? Give your answer in bits per second. (2 marks)

b) Explain how IEEE 802.11g manages to transmit data at 54Mbps. (6 marks)

c) Why is 54Mbps not the actual data transfer rate as achieved by applications sending and receiving data on each device? (3 marks)

d) What happens to the communications channel between the devices as the distance between the two devices increases? How do the devices adapt in order to maintain communication? (5 marks)

e) A third IEEE 802.11g device using the same channel is operating near by. Give two examples of how the third device can interfere with on-air transmissions between the other two devices. What would be the result of this interference if it were to occur? (4 marks)
3. a) Why are 2G and 3G mobile phones required to “handover” from one base station to another? (4 marks)

b) Briefly describe how handover is implemented in typical 2G and 3G mobile telecommunication systems. How is system hierarchy exploited to limit the complexity required for most handovers? (5 marks)

c) How are the mobile phone carrier’s databases used during handover? (4 marks)

d) In order to implement handover, control frames must be exchanged between components of the mobile phone and carrier’s systems.

   i) Draw a diagram to illustrate a possible flow of frames exchanged within a 2G GSM like phone system when a mobile phone initiates a handover between two transceivers belonging to the same controller. (4 marks)

   ii) For your equivalent of a “handover request” frame, list the necessary frame contents and briefly state why each field is present. (3 marks)