Student ID:_____

UNIVERSITY OF OTAGO EXAMINATIONS 2014

INFORMATION SCIENCE

TELE303

Mobile Systems

Semester One

(TIME ALLOWED: 3 HOURS)

This examination paper comprises 5 pages

Candidates should answer questions as follows:

Answer ALL questions
The exam is marked out of 100. It is worth 50% of the course

The following material is provided:

NIL

Use of calculators:

No calculators are permitted

Candidates are permitted copies of:

NIL

Other Instructions:

You need to draw on Figure 2 for Question No.8 (on page 3) as part of your answers.

Please hand in the entire exam paper attached to the answer book/s.

TURN OVER

1. Using the Shannon's Capacity Theorem, explain

   (a) why a transmission channel of broader bandwidth is preferred; and

   (b) why a coding scheme of higher signal-to-noise ratio is preferred.

   (2 marks)

2. List **four** major factors that affect the TCP performance in mobile ad hoc networks (MANET). (4 marks)

3. (a) What are the similarities and differences between two MANET routing protocols: DSR (Dynamic Source Routing) and AODV (Ad hoc On-demand Distance Vector)? (4 marks)

   (b) In an ad hoc network with a topology as shown in Figure 1, Node A is to establish a route to reach Node H using either DSR or AODV. Give three possible routes found by DSR, and the most likely route found by AODV. (4 marks)

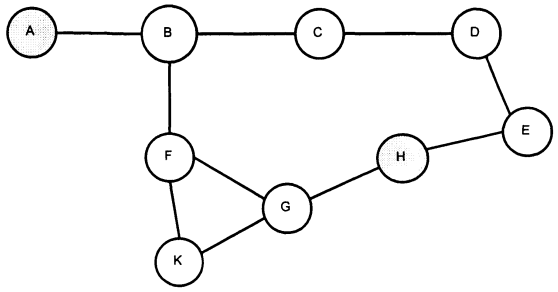

Figure 1: *An ad hoc network topology.*

4. Describe and compare both Frequency-Hopping Spread Spectrum (FHSS) and Direct Sequence Spread Spectrum (DSSS). (4 marks)

5. Give a description of the 'hidden terminal problem' in a wireless LAN and explain how it can be solved. You should use diagrams that present a spatial arrangement of a few network transmitters to illustrate the problem. (6 marks)

6. Figure 2 shows a scheme with multiple frequency-shift keying (MFSK) input encoding and a pseudonoise (PN) sequence for Frequency Hopping Spread Spectrum (FHSS).

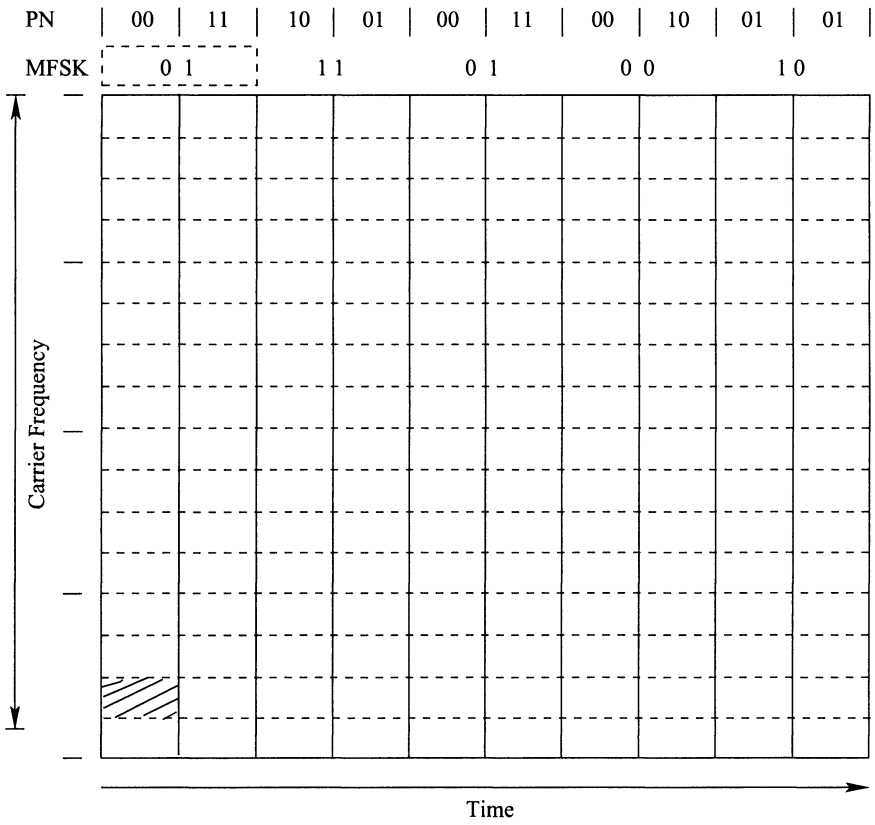

Figure 2: *FHSS with MFSK (with M=4 and 2 bits PN interval)*

(a) Is this an example of slow frequency hopping or fast frequency hopping, and why? (3 marks)

(b) Follow the example (given as a shadowed cell) and mark on the figure the carrier frequencies to be used over time. (4 marks)

7. Name **four** types of impairments encountered by signals propagating in unguided media. (4 marks)

8. Briefly outline **four** common medium access control methods used in wireless communications. (4 marks)

9. In a mobile ad hoc network:

   (a) Why is Dynamic Source Routing (DSR) vulnerable to fabrication attacks? Give an example. (3 marks)

   (b) How does the Secure Routing Protocol (SRP) resolve this problem? (2 marks)

10. What is WiMAX and what kind of signal encoding does it employ? Give a brief description with a diagram to explain how its signal encoding works. (6 marks)

11. This question relates to low earth orbiting (LEO) satellites and geostationary earth orbiting (GEO) satellites.

   (a) Briefly describe both LEO and GEO, highlighting the differences between them in terms of orbit period, altitude, and round-trip delay. (3 marks)

   (b) Under what circumstances would it be advantageous to select one of these satellite types (GEO and LEO) over the other? (3 marks)

12. Explain the following two attacks to wireless sensor networks (WSN) and suggest a possible solution:

   (a) Blackhole (2 marks)

   (b) Playback (2 marks)

13. Give a brief overview of the function of mobile IP. In this connection, mention the operation of the home agent and the foreign agent. (6 marks)

14. In a CDMA cellular system, what are the factors that make power control desirable? (4 marks)

15. Android offers several ways to realize your program, namely Android Web Applications, Android Applications, and Android Native Applications. Please indicate their main difference(s) and give example use cases that are recommended for each. (6 marks)

16. How does Android handle Activities that are currently not visible (e.g., they are stopped or paused) and how does Android avoid running out of memory? (4 marks)

17. The Android build process consists of two major steps: Compiling and Packaging, and Signing. Please explain the steps and program files (parts) involved when Compiling and Packaging. (2 marks)

18. How does Android resolve implicit Intents and why can this be a security issue when application components are started with implicit intents? (4 marks)

19. Briefly explain what the calls to "findViewById()" and and "setOnClickListener()" do within the following code:

```
public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);
        ...
        Button myButton = (Button) findViewById(R.id.myButton);
        mybutton.setOnClickListener(new Button.OnClickListener() {
                    public void onClick(View v) { /* do stuff */ }
        }
}
```

(2 marks)

20. Explain the concept of "Fragments" in Android and why it was introduced. (2 marks)

21. The following XML expression is used for creating and describing a Android button in a XML layout file. What is the meaning of the @ and + in the "android:id" tag? (2 marks)

```
<Button
android:id="@+id/button1"
android:layout_height="wrap_content"
android:layout_width="match_parent"
android:text="Push me!"/>
```

(2 marks)

22. Explain the major contribution and idea of Assisted GPS (AGPS) and Differential GPS (DGPS) compared to traditional GPS. (2 marks)

23. When evaluating mobile applications one can use a qualitative or a quantitative approach. Describe the general idea and the drawbacks of each approach, and also give an example of when to use them. (6 marks)

END