

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION

SUMMER SEMESTER, 2018-2019

DURATION: 3 Hours

FULL MARKS: 150

CSE 4671: Wireless and Mobile Communication

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **8 (eight)** questions. Answer any **6 (six)** of them.

Figures in the right margin indicate marks.

1. a) Illustrate a timeline diagram of a successful retransmission (a collision and then a successful transmission) in the current WLAN protocol (802.11) when 3 stations are trying to access the channel at the same time. (You do not have to use CTS/RTS). 12
- b) From the Figure 1, identify which of the nodes are “exposed” and which are “hidden”. 5

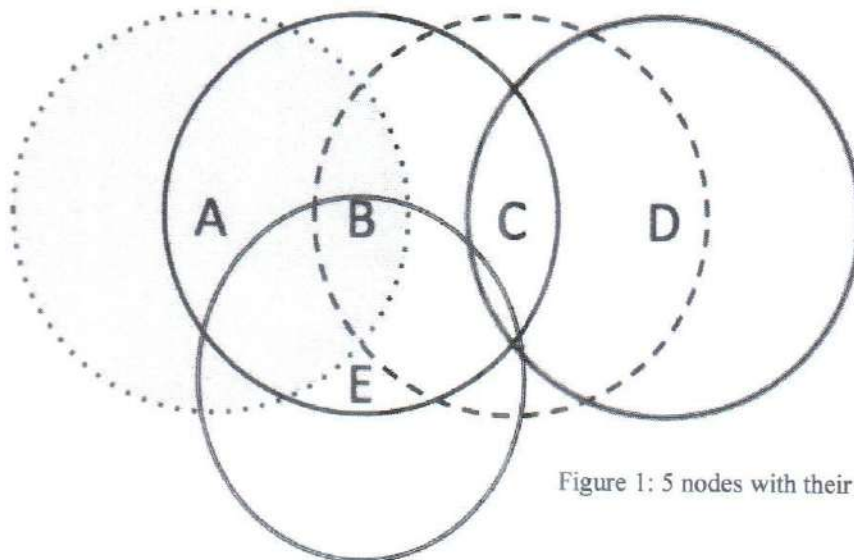


Figure 1: 5 nodes with their interference range

- | | | |
|----|---|-----|
| c) | What is a “Hidden Terminal”? What is an “Exposed Terminal”? | 4+4 |
| 2. | a) What is post-backoff and why is it used? | 5 |
| | b) How does PCF provide Quality of Service (QoS)? | 10 |
| | c) Explain the problems of PCF. | 10 |
| 3. | a) How does Hybrid Coordination Function (HCF) solve the problems (in Figure 2) of Point Coordination Function (PCF) in providing QoS guarantee? Be specific. | 6 |

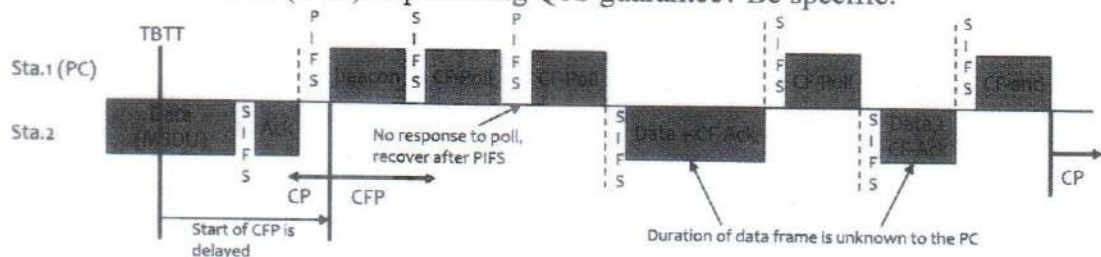


Figure 2: Point Coordination Function (PCF)

- | | | |
|----|--|----|
| b) | Hybrid Coordination Function (HCF) has four access categories – Briefly describe them. | 12 |
| c) | Draw a simple diagram of a superframe of HCF which contains the followings: | 7 |
| | i. Contention Period (CP) and Contention Free Period (CFP) | |
| | ii. Fragmented packets | |
| | iii. Controlled Access Phase (CAP) inside a Contention Period (CP) | |

4. a) There are two types of correlation in CSMA/CN (preamble correlation and signature correlation), what is each of them used for and how they are used? 7
- b) Collision Notification is a creative way to implement collision detection in wireless communications. What are the problems of using Collision Notification in wireless CSMA? 8
- c) Figure 3 contains an overview of a network with end systems and routers. Mark the nodes which are part of the access network, core network, and edge network. Justify your answer (if required, define the networks). 10

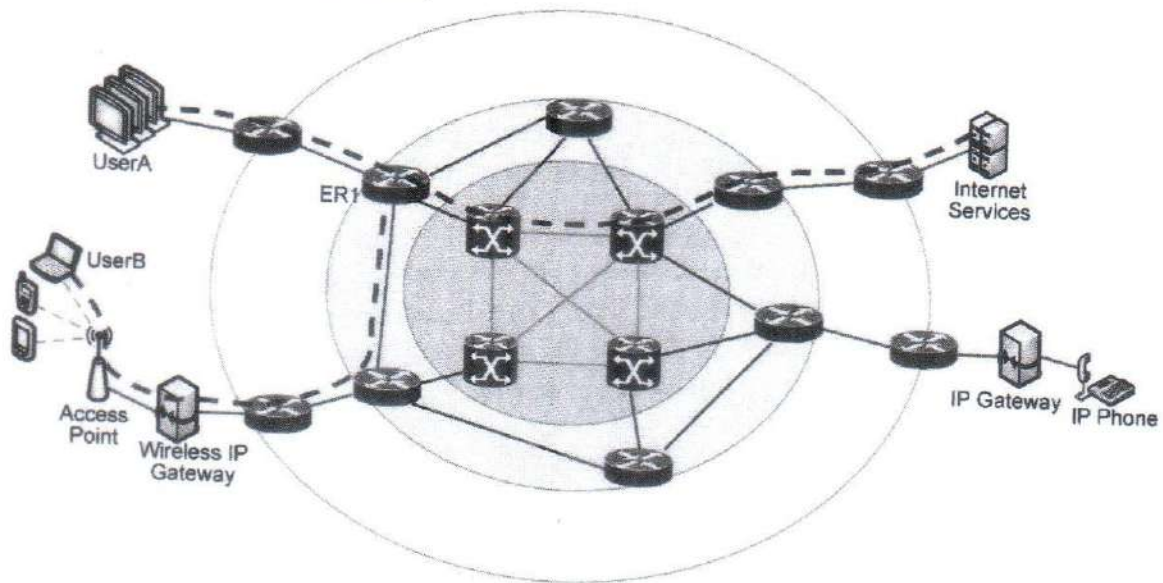


Figure 3: an example network overview

5. a) What is Wastage-Aware Routing? Explain the term "Sastage". 6
- b) Find the path that wastes the least energy. Demonstrate your calculations based on scenario shown in Figure 4. 11

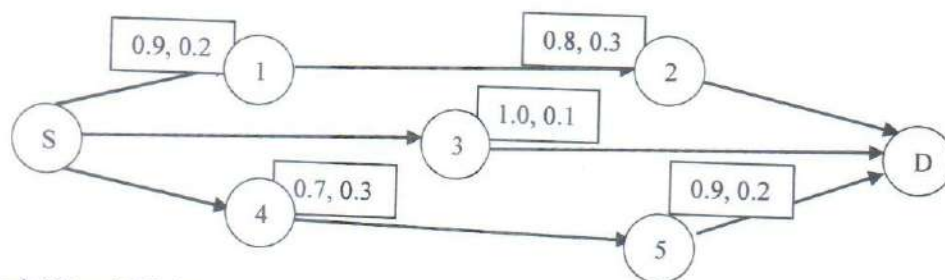


Figure 4: 'S' and 'D' denote source and destination and each hop consumes 0.1 battery life. Each box contains the current battery life followed by the amount of battery consumed for each transmission.

- c) How is the expected transmission count (RTX) calculated for a successful data packet delivery (including acknowledgement)? 8
6. a) Explain how are wireless sensor networks (WSNs) different from other wireless networks? 8
- b) Define the two different WSN architectures and write their advantages. 6
- c) WSN-MAC has many classifications. Explain those classifications. 11
7. a) What are "Synchronized islands"? 5
- b) How does RIMA-MAC protocol handle collisions? 10
- c) How does LEACH select its cluster heads? 10

8. a) Existing medium access control protocols (MACs) for collision avoidance in wireless networks can be classified into four categories 8
- Co-ordination based schemes
 - Multi-frequency assisted schemes
 - Slot-assignment schemes
 - Backoff-tuning schemes

Which protocol falls under which category and why? Take help from the Table 1.

Table 1: Protocol Propositions

Protocol Name	Description
HiBo	Performs hierarchical backoff on nodes.
PC protocols	Provides perfect coordination (according to name) through learning phase and transmission phase.
CSMA/ECA	Variation of the original protocol CSMA collision avoidance.
Back2F	Migrates contention from time domain to frequency domain.

- b) Write the problems or disadvantages of the four MAC protocols. 12
- c) Which is the better of these protocols? Give your own justification. 5