Xi'an Jiaotong-Liverpool University

西交利物浦大學

PAPER CODE	EXAMINER	DEPARTMENT	TEL
CSE311		Computer Science	

1st SEMESTER 2018/19 FINAL EXAMINATIONS

BACHELOR DEGREE – Year 4

Mobile Computing

TIME ALLOWED: 2 Hours

INSTRUCTIONS TO CANDIDATES

1、 Total marks available are 100.

2、 Answer all questions.

3、 The number in the column on the right indicates the marks for each question.

4、 Answer should be written in the answer booklet(s) provided.

5、 The university approved calculator - Casio FS82ES/83ES can be used.

6、 All the answers must be in English.

(1) Location based services (LBS) are widely offered in today's smartphones. Answer the following questions on LBS. [10]

(a) Discuss how LBS can respond to three different types of context. 6'

(b) Some applications like Google Map can locate a smartphone without using GPS. Outline two GPS-free location methods. Compare them with GPS in terms of accuracy. 4'

(2) Answer the following questions on speech-based interaction. [6]

(a) Provide two examples of when a speech-based interface (input and output) would be preferred over a touch screen interface. 3'

(b) Fingerprint and facial expression have been used commonly by today's smartphone for biometric authentication. In contrast, voice authentication is not widely used. List two disadvantages for voice authentication. 3'

(3) Three mobile phones A, B, and C want to communicate with a base station at the same time. Develop a spreading code for each of them and show how your spreading codes can help to avoid interference among these mobile phones. [10]

(4) A mobile host Alice travels from XJTLU campus network to the neighboring SuDa campus network. The packets delivered to Alice will be tunneled via triangle routing. Answer the following questions regarding mobile IP. [14]

(a) There is another XJTLU mobile host Bob currently visiting SuDa campus network. Is it possible for Alice and Bob to use the same care-of-address? Explain your answer. 6'

(b) Instead of using mobile IP, Alice wants to retain her XJTLU IP address. Is this possible? Give a brief explanation. Name two advantages and two disadvantages of this scheme compared to the Mobile IP. 8'

(5) Suppose there are two mobile nodes, a source and a destination, in an 802.11b WLAN. [14]
Answer the following questions on CSMA/CA.

(a) Describe the CSMA/CA method at the source and destination, respectively, assuming that Request to Send (RTS)/ Clear to Send (CTS) is not used. 8

(b) When using RTS/CTS, explain what would prevent a hidden terminal from interfering with a source node? 2'

(c) When using RTS/CTS, explain how an exposed terminal decides it is safe to send to another destination? 4'

(6) Following Question (5), the source and destination nodes are configured to use RTS/CTS. The distance between them is 750 meters. Assume both of them are equipped with powerful enough radios to communicate at this range. There are no other nodes operate in the area. Answer the following two questions: [20]

(a) What will be the data throughput between these two nodes? 14'

(b) Is there any way to improve the data throughput? Name three. 6'

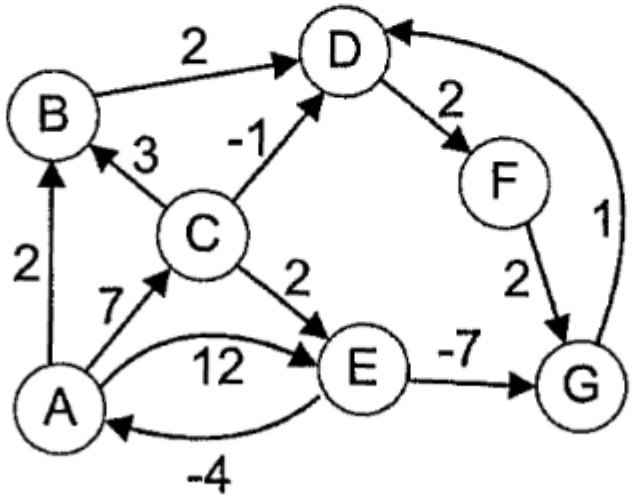
Below are some parameters your calculation:

- WiFi signal propagation speed is $3*10^8$ m/s.

- Every packet carries 110 bytes of data.
- Data transmission speed at both nodes is 11 Mbps.
- DIFS is set to be 50us.
- SIFS is set to be 10us.
- ACK, RTS, and CTS each have a 150 us transmission time.
- Contention window (CW) is chosen randomly for each packet. When there is no contention, it is uniformly likely to be anywhere from 0 to 31 slots long, where one slot is 20us.
- The preamble, the physical layer header, the MAC header and trailer take a combined 170us per packet to transmit.

(7) Dijkstra's algorithm is designed to find the shortest path of a network. When a network has negative edges, the shortest path found by Dijkstra's algorithm may be incorrect. Answer the following question on Dijkstra's algorithm. [26]

(a) Suppose you are asked to use the Dijkstra's algorithm to calculate the shortest paths from A to every other vertex in the network below. Complete the table to show the distance values from A to all nodes at each iteration of the algorithm (Place your answer in the answer booklet). 14'



Iteration	A	B	C	D	E	F	G
0	0	∞	∞	∞	∞	∞	∞
…							

(b) The shortest paths found by the Dijkstra's algorithm are incorrect to some of the vertices. List out those vertices and indicate the correct shortest paths to them. 9'

(c) The above mistakes can be avoided by simply removing one edge from the graph. Which one would you remove and why? 3'

END OF EXAM PAPER