Coversheet for centrally scheduled online non-invigilated exams

Exam information	
Course code and name	COMS3200/7201 Computer Networks I
Semester	Semester 1, 2020
Exam type	Online, non-invigilated
Exam date and time	Please refer to your personalised timetable
Exam duration	*Select and update the statement applicable to your exam.* • Working time (120 minutes) + additional online allowance (for a PDF file upload): 30 minutes = TOTAL exam duration: 2 hrs 30 minutes from exam commencement time
Exam window	*Select and update the statement applicable to your exam.* • You must commence your exam at the time listed in your personalised timetable. The exam will remain open **only** for the duration of the exam.
Reading time	Reading time has not been formally allocated for online exams, however students are encouraged to review and plan their approach for the exam before they start. The total exam time should be sufficient to do this.
Additional time	30 minutes additional time has been incorporated in recognition of the online environment and the different circumstances that students face in their home environments. This includes allowances for network or connection issues. You have to upload your working sheets (as a single PDF file) to the Final Exam upload.
Weighting	This exam is weighted at 60% of your total mark for this course for COMS3200. This exam is weighted at 55% of your total mark for this course for COMS7201.
Permitted materials	This is an open book exam – all materials permitted.
Required/recommended materials	List any materials required for students to be successful with the exam - calculator; scanner/phone-based scanner
Instructions	• You have to download and print the final exam answer book (working sheets) (Final exam answerbook (working sheets) download). • You can use blank paper(s) (A4 size is recommended) only if you are unable to print the answer book (working sheets).

	• Enter your answers on the Final Exam (Online Quiz) and also upload your 'scanned' answer book (working sheets) including your answers and workings as a single PDF file to the COMS3200/7201 Learn (Final Exam Answer book upload).
Who to contact	*Given students may not all undertake the online exam at the same time, or in the same time zone, and that some questions may be randomised, responding to student queries and/or relaying corrections to exam content during the exam will not be feasible.* In your exam, there is a free text box field (Question 14 in the online quiz). Please use this to specify any assumptions you have made in completing the exam and which questions those assumptions relate to. You may also include queries you may have made with respect to a particular question, should you have been able to 'raise your hand' in an examination room. If you experience any **technical difficulties** during the exam, contact the Library AskUs service for advice (open Monday – Friday 7.30am – 8.45pm and Saturday 9.00am – 7.30pm). You should also ask for an email documenting the advice provided so you can provide this to the course coordinator immediately at *dan.kim@uq.edu.au*.
Important exam condition information	This is an open book exam. You will have access to your own notes, course texts, and other materials. The normal academic integrity rules apply. • You cannot cut-and-paste material other than your own work as answers. • You are not permitted to consult any other person – whether directly, online, or through any other means – about any aspect of this assessment during the period that this assessment is available. If it is found that you have given or sought outside assistance with this assessment then that will be deemed to be cheating and will result in disciplinary action. By undertaking this online assessment you will be deemed to have acknowledged UQ's academic integrity pledge to have made the following declaration: *"I certify that my submitted answers are entirely my own work and that I have neither given nor received any unauthorised assistance on this assessment item"*.
Late submission of exams	If you have a technical problem, you should collect evidence (photo/screenshot if possible) and make a statement about the incident. You should submit as soon as the problem is alleviated. Should the problem extend beyond 30 minutes, you should gather evidence at regular intervals (e.g. a screenshot every 1 hour). If you do not submit the exam on time, or within the approved extended time, you will receive '0' mark, unless there is sufficient evidence that the late submission is beyond your control. Without a reason preventing submission there is a 100% penalty.

	Course coordinators decide on the evidence presented whether they will accept a late submission. You can appeal to the Associate Dean (Academic).

Preview Test: Final Exam (Online Quiz)

Test Information

Description

School of Information Technology and Electrical Engineering

EXAMINATION

Semester One Final Examinations, 2020

COMS3200/7201 Computer Networks I

This paper is for St Lucia Campus students.

Instructions

Examination Duration:	**120 minutes**
Reading Time:	**None**

- This is a Central On-line , Open Book Examination
- You are permitted to use any calculator and/or Excel

- Answer ALL questions. Strictly answer according to the instruction given.
- Pay close attention to the UNIT, FORMAT.100 marks total on the paper.
- Marks for each question are as indicated.

You are to use A4 paper for all your workings, which should be clearly numbered and indicate the exam question being worked on. Once complete, you are only required to enter the answers in Blackboard. All workings papers needs to be scanned and combined in a single PDF and uploaded.

In case of the need to award partial marks on discrepancies your PDF will be referred to and is a COMPULSORY submission.

Multiple Attempts: Not allowed. This test can only be taken once.

Force Completion: This test can be saved and resumed later.

QUESTION 1

14 points Save Answer

(14 marks total) {Quantitative Comparison of Packet Switching and Circuit Switching}
Consider the two scenarios below: a circuit-switching scenario in which Ncs users, each requiring a bandwidth of 10 Mbps, must share a link of capacity 50 Mbps. A packet-switching scenario with Nps users sharing a 50 Mbps link, where each user again requires 10 Mbps when transmitting, but only needs to transmit 30 percent of the time.

(a) (2 marks) When circuit switching is used, what is the maximum number of circuit-switched users that can be supported?

For the remainder of this problem, suppose packet switching is used.

(b) (2 marks) Suppose there are 10 packet-switching users (i.e., Nps = 10). What is the probability that a given (specific) user is transmitting, and the remaining users are not transmitting?

(c) (3 marks) What is the probability that one user (any one among the 10 users) is transmitting, and the remaining users are not transmitting?

(d) (3 marks) What is the probability that any 6 users (of the total 10 users) are transmitting and the remaining users are not transmitting?

(e) (4 marks) What is the probability that more than 4 users are transmitting?

QUESTION 2

10 points Save Answer

{HTTP GET}

Suppose that a server receives the following HTTP GET message from a client browser:

```
GET /main/test1.html HTTP/1.1 \r\n
Host: www.uq2.edu.au \r\n
User-agent: Firefox/3.6.12 \r\n
Accept: text/html, application/xhtml+xml \r\n
Accept-language: en, fr; q = 0.8, en-nz; q =0.5  \r\n
Accept-Encoding: gzip, deflat \r\n
Connection: close \r\n
\r\n
```

(a) (2 marks) What is the name of the file that is being retrieved in this GET message? Please use file name only.

(b) (2 marks) What version of HTTP protocol does the browser use? Please use only number.

(c) (2 marks) What is the language preference of the browser user mostly prefers to use?

(d) (2 marks) Does the browser want to have persistent connections? Answer Yes, No or Undecidable.

(e) (2 marks) Assume that the browser has received "internal server error" from the web server. What is response code for it? Please provide the numerical value.

QUESTION 3

10 points Save Answer

(10 marks total) {Transport layer}
The following is a dump (contents) of a UDP header in hexadecimal format.

E555001500403A6B

(a) (2 marks) What is the source port number in decimal form? Show your working in the working sheet.

(b) (2 marks) What is the destination port number? Show your working in the working sheet.

(c) (2 marks) What the total length of the user datagram **in bits**? Show your working in the working sheet.

(d) (2 marks) What is the length of the data **in bytes**? Show your working in the working sheet.

(e) (2 marks) What is the checksum value in hexadecimal form?

QUESTION 4

10 points Save Answer

Consider a scenario that TCP a sender and receiver communicate over a connection in which the sender-to-receiver segments may be lost in Figure 1. The TCP sender sends initial window of four segments at t=1,2,3,4, respectively. Suppose the initial value of the sender-to-receiver sequence number is 116 and the first four segments each contain 502 bytes. The delay between the sender and the receiver is 7 time units, and so the first segment arrives at the receiver at t=8. As shown in the figure, two of the four segment(s) are lost between the sender and the receiver.

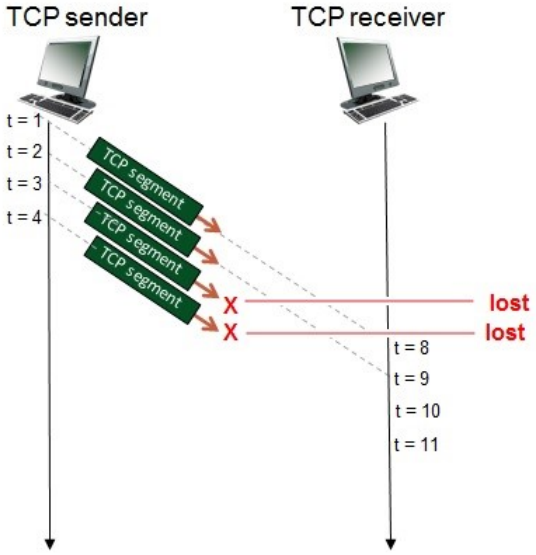

Figure 1. TCP sequence and ACK numbers with segment loss

Answer the following questions (2 marks each) in the table below:

- Fill in the sequence numbers associated with the segments sent by the sender.
- Fill in the time the segments were received.
- Fill in the acknowledgment field of each receiver-to-sender acknowledgment, and give a brief explanation as to why that particular acknowledgment number value is being used.

Sender-to-Receiver	Time segment sent	Sender-to-receiver segment sequence number field value	Time segment received, and ACK segment sent	Receiver-to-sender ACK field value
Segment 1	1	116	8	
Segment 2	2			
Segment 3	3	1120	-	No ACK is sent, since this segment was lost
Segment 4	4		-	No ACK is sent, since this segment was lost

QUESTION 5

20 points Save Answer

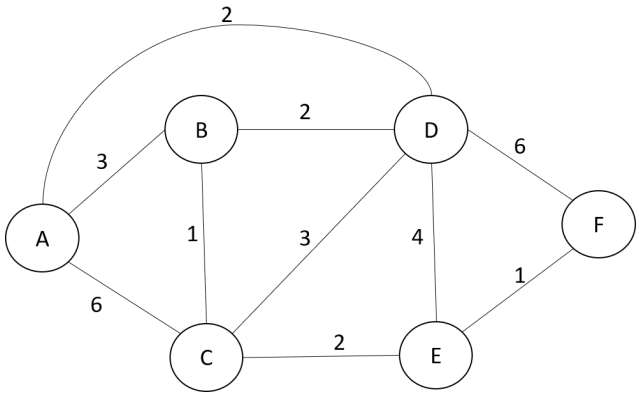

Figure 2. An example network 1.

(a) (10 marks total) Apply the Dijkstra algorithm on the example network 1 in Figure 2 to find the minimum-cost routes from **station A** to all other stations. Please make a table for the final value. S is the set of stations whose least-cost path is known; D(v) is the current cost of path from source (i.e., station 1) to station v; p(v) is the predecessor station along path from source to v, that is next to v.

Please use "inf" to specify an infinite cost and "-" to specify no predecessor respectively.

The following table has not been completed filled on purpose. 'X' is used to indicate that that cell will be filled with information.

Step	S	D(B), p(B)	D(C), p(C)	D(D), p(D)	D(E), p(E)	D(F), p(F)
0	A	3, A	6, A		inf,-	
1	X		5, D	X	X	X
2	X	X		X		X
3	X	X	X	X	X	X
4	X	X	X	X	X	
5	ABCDEF	X	X	X	X	X

(b) (10 marks total) Apply the Bellman-Ford algorithm on the example network 1 given in Figure 2 to find the minimum-cost routes from **station B** to all other stations.

Please use "inf" to specify an infinite cost and "-" to specify no next hop respectively.

The following table has not been completed filled on purpose. 'X' is used to indicate that that cell will be filled with information.

Dest.	Hop 1		Hop 2		Hop 3		Hop 4		Hop 5	
	cost	hop	cost	hop	cost	hop	cost	hop	cost	hop
A	3		X	X	X	X	X	X	X	X
C	1		X	X	X	X	X	X	X	X
D	2	D	X	X	X	X	X	X	X	X
E	inf	-			X	X	X	X	X	X
F	inf	-		X		X	X	X	X	X

QUESTION 6

2 points Save Answer

Question 6. [IP/subnet] Please choose which class the following IPv4 Address belongs to.
(2 marks) 192.168.1.2

- None
- class B
- class D
- class A
- class C
- class E
- invalid IP address
- localhost

QUESTION 7

2 points Save Answer

Question 6. [IP/subnet] Please choose which class the following IPv4 Address belongs to.
(2 marks) 2.2.2.2

- None
- localhost
- invalid IP address
- class C
- class B
- class A
- class E
- class D

QUESTION 8

2 points Save Answer

Question 6. [IP/subnet] Please choose which class the following IPv4 Address belongs to.
[2 marks] 223.265.200.1

- None
- invalid IP address
- class E
- class B
- class D
- class C
- localhost
- class A

QUESTION 9

3 points Save Answer

(3 marks) Suppose an ISP owns the block of addresses of the form for IP address 224.1.1.1/24. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What is the total number of usable hosts? Show your works on the working sheet.

QUESTION 10

3 points Save Answer

For the question 6(e)and(f). Your company wants to utilize the private class C IP Address of 192.164.1.0. You are tasked with subnetting the address to get the most networks with at least 30 hosts per subnet.

(3 marks) How many networks will be created after you complete subnetting?

QUESTION 11

3 points Save Answer

Your company wants to utilize the private class C IP Address of 192.164.1.0. You are tasked with subnetting the address to get the most networks with at least 30 hosts per subnet.

(3 marks) What is the first usable IP Address in the 1st Network range?

QUESTION 12

15 points Save Answer

{Error detection and correction}

(a) (2 marks) What is the Internet checksum value for these two 16-bit words (use one's compliment addition).
Answer it without space between binary digits.

1000 0110 0101 1110
1010 1100 0110 1000

(b) (2 marks) What is the parity bit for 0100111 when the **odd** one-dimensional parity scheme?

(c) (2 marks) What is the parity bit of 1100110 when the **even** one-dimensional parity scheme?

(d) (3 marks) The two-dimensional (2D) **even** parity scheme is used for the following data:

01110 01010 01001 11001

Suppose that 5 bits are used in one row for the 2D parity. What are the first four parity bits in the column only?

For k=2 and n=4, we can make the following assignment.

No	Data Block	Codeword
1	00	0001
2	01	0011
3	10	1000
4	11	1110

(e) (2 marks) What is the minimum Hamming distance when a codeword block is received with the bit pattern 1001?

(f) (2 marks) Can the error be detected (Yes or no) when the received codeword is 1101? Choose one: Yes, No or Undecidable.

(g) (2 marks) Can the error be corrected when the received codeword is 1001? Choose one: Yes, No or Undecidable.

QUESTION 13

6 points | Save Answer

Figure 3 shows a Wireshark screen shot that analyses the trace of a TCP segment sent and received directly by uploading a 150KB text file from a computer to a remote server.
The six segments sent by the client (192.168.1.102) to the server (128.119.245.12) are No. 4, 5, 7, 8, 10, and 11 (these are marked in a red highlighted box).

1	0.000000	192.168.1.102	128.119.245.12	TCP
2	0.023172	128.119.245.12	192.168.1.102	TCP
3	0.023265	192.168.1.102	128.119.245.12	TCP
4	0.026477	192.168.1.102	128.119.245.12	TCP
5	0.041737	192.168.1.102	128.119.245.12	TCP
6	0.053937	128.119.245.12	192.168.1.102	TCP
7	0.054026	192.168.1.102	128.119.245.12	TCP
8	0.054690	192.168.1.102	128.119.245.12	TCP
9	0.077294	128.119.245.12	192.168.1.102	TCP
10	0.077405	192.168.1.102	128.119.245.12	TCP
11	0.078157	192.168.1.102	128.119.245.12	TCP
12	0.124085	128.119.245.12	192.168.1.102	TCP
13	0.124185	192.168.1.102	128.119.245.12	TCP
14	0.169118	128.119.245.12	192.168.1.102	TCP
15	0.217299	128.119.245.12	192.168.1.102	TCP
16	0.267802	128.119.245.12	192.168.1.102	TCP
17	0.304807	128.119.245.12	192.168.1.102	TCP
18	0.305040	192.168.1.102	128.119.245.12	TCP

Fig.3. a Wireshark screentshot.

(a) (3 marks) Considering the difference between when each TCP segment was transmitted and when its acknowledgement was received, what is the Round Trip Time (RTT) value of the second of the six segments?

(b) (3 marks) What is the EstimatedRTT of the second segment after receiving the ACK? Assume that the EstimatedRTT equal to the measured the Round-Trip Time (RTT) for the first segment.

QUESTION 14

0 points | Save Answer

Please specify any assumptions you have made in completing the exam and which questions those assumptions relate to.