THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

This exam paper must not be removed from the venue

Venue _____

Seat Number _____

Student Number |__|__|__|__|__|__|__|__|

Family Name _____

First Name _____

School of Information Technology and Electrical Engineering

EXAMINATION

Semester One Final Examinations, 2017

COMS3200 / COMS7201 Computer Networks I

This paper is for St Lucia Campus students.

Examination Duration: 120 minutes

Reading Time: 10 minutes

Exam Conditions:

This is a Central Examination

This is an Open Book Examination

During reading time - write only on the rough paper provided

This examination paper will be released to the Library

Materials Permitted In The Exam Venue:

(No electronic aids are permitted e.g. laptops, phones)

Calculators - Any calculator permitted - unrestricted

Materials To Be Supplied To Students:

None

Instructions To Students:

Additional exam materials (eg. answer booklets, rough paper) will be provided upon request.

Answer ALL questions. 110 marks total on the paper. Marks for each questions are as indicated. Questions are to be answered in the spaces provided on this exam paper.

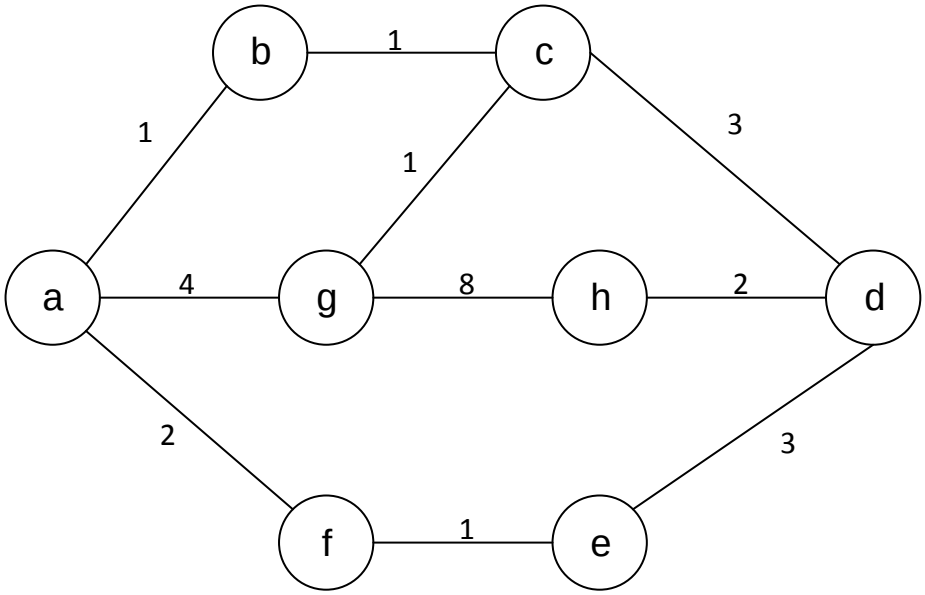
For Examiner Use Only

Question	Mark

Total _____

Question 1. (20 marks).

Consider the following network of routers, a, b, c, d, e, f, g, h with associated routing costs between each of the routers shown on the connecting links.



Use Dijkstra's method to calculate the minimum path to each router from node **g**. The table below is provided for your working, if you wish to use it.

Step	N'	D(a), p(a)	D(b), p(b)	D(c), p(c)	D(d), p(d)	D(e), p(e)	D(f), p(f)	D(h), p(h)
0	g							
1								
2								
3								
4								
5								
6								
7								
8								

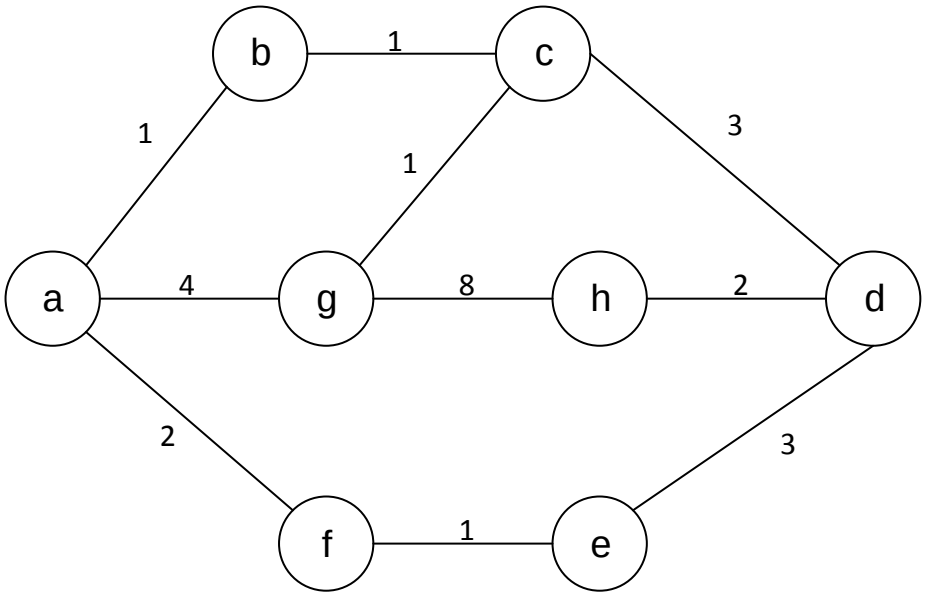
The Min Path and distances are to be entered on the table on the next page

…./

Question 1 (cont)
(a) Show both the minimum distance path (e.g. gcdh) and the minimum distance (e.g. 11) to each node from g in the table below. (14 marks)

From node g to…	Minimum Path	Minimum Distance
a		
b		
c		
d		
e		
f		
h		

(b) Highlight the links on the graph below to show the minimum spanning tree starting at node g, i.e. show the links constituting the minimum path to each node from g. (3 marks)



(c) If output ports from **g** to nodes **a**, **c**, and **h** are called ‘ga’, ‘gc’ and ‘gh’ respectively, show a forwarding table, based on the above minimum paths, which shows the output links from g for all destination nodes. (3 marks)

List of Destination Nodes	To be sent over link
	ga
	gc
	gh

Question 2. (20 marks).

The following table describes the purpose of different networking protocols. For each of these protocols, give the acronym (abbreviated name) of the relevant protocol, and the relevant layer of the Internet protocol stack. If more than one correct answer is possible, then any correct answer will be accepted.

Purpose of this Protocol	**Name**	**Layer**
Example: Retrieve web pages	*HTTP*	*Application*
1. Convey network management control and information messages		
2. Send email messages to a mail server		
3. Download email messages from a mail server		
4. “Ping” a host		
5. Covert a hostname to an IP address		
6. Convert an IP address to a MAC address		
7. Sending intra-AS link-state routing messages		
8. Setting up multimedia data stream connections		
9. Providing connectivity between hosts and access points in WiFi networks		
10. An enhanced version of connection-oriented stream transport which adds security		

Question 3. (20 marks)

The following 72 bytes (shown in hexdecimal) are from the packet dump of a TCP packet inside an IP datagram inside an Ethernet frame. Note that unlike a normal Wireshark packet dump, this packet dump **does** include the Ethernet preamble and the Ethernet CRC.

(The bytes are in the same order as normally shown in Wireshark, left to right across the whole page)

```
aa aa aa aa aa aa aa ab  00 00 5e 00 01 08 98 90
96 d8 35 a9 08 00 45 00  00 28 41 71 40 00 80 06
00 00 0a 21 02 98 d0 5c  ec 52 e1 75 00 50 e7 3e
50 0c 1b a0 80 d4 50 11  f7 39 c9 82 00 00 00 00
00 00 00 00 c8 aa ab cd
```

Complete each of the following fields of the various protocol layers (in the indicated format). (1 mark each)

Field	(Format) Value
Ethernet Source Address	(Hexadecimal)
Ethernet Destination Address	(Hexadecimal)
IP Source Address	(Dotted Decimal)
IP Destination Address	(Dotted Decimal)
TCP Source Port	(Decimal)
TCP Destination Port	(Decimal)
IP Version	(Decimal)
IP Header Length in bytes	(Decimal)
IP Datagram Length in bytes	(Decimal)
TCP Flags	(Binary) URG:
	(Binary) ACK:
	(Binary) PSH:
	(Binary) RST:
	(Binary) SYN:
	(Binary) FIN:
TCP Sequence Number	(Hexadecimal):
TCP Acknowledgement Number	(Hexadecimal):
IP Header Checksum	(Hexadecimal)
TCP Internet Checksum	(Hexadecimal)
Ethernet CRC	(Hexadecimal)

Question 4 (35 marks)

Each of the following questions asks you to describe the difference between two similar concepts. In some cases you will also be asked to give an advantage of each of the two similar techniques compared to the other.

Just a few sentences are required for each answer

Question 4 (a) 5 marks

Describe the key difference between **link-state** routing and **distance-vector** routing.
Describe one advantage of **link-state** routing:
Describe one advantage of **distance-vector** routing:

Question 4 (b) 5 marks

Describe the key difference between conventional IP **destination-based forwarding** and **software-defined-networking** routing.
Describe one advantage of conventional IP **destination-based forwarding**:
Describe one advantage of **software-defined-networking** routing:

Question 4 (c) 5 marks

Describe the key difference between **TCP** (connection-based) and **UDP** (connectionless) transport layer services.
Describe one advantage of **TCP transport-layer services**:
Describe one advantage of **UDP transport-layer services**:

Question 4 (d) 5 marks

Describe the key difference between "**Go-Back-N**" and "**Selective-Repeat**" mechanisms for reliable data transport.
Describe one advantage of **Go-Back-N**:
Describe one advantage of **Selective-Repeat**:

Question 4 (e) 5 marks (Note different question wording below)

Describe the key difference between **TCP flow-control** and **TCP congestion control**.
What is the main mechanism used to implement **TCP flow control**?
Describe one of the mechanisms that is used to implement **TCP congestion control**.

Question 4 (f) 5 marks (Note different question wording below)

Describe the key difference between **CSMA/CD** and **CSMA/CA** media access protocols.
Give an example of a link layer protocol that uses **CSMA/CD**:
Give an example of a link layer protocol that uses **CSMA/CA:**

Question 4 (g) 5 marks (Note different question wording below)

Explain the difference between an **IP Router** and an **Ethernet Switch.**
What is one typical mechanism used to set the routing table entries in an **IP Router**?
What is one typical mechanism used to set the switch table entries in an **Ethernet Switch**? .

Question 5. (15 marks)

Circle the appropriate responses indicating whether each of the following statements are true (T) or false (F).

One mark for a correct answer, -1 mark for an incorrect answer, 0 if no answer is given.

Question	True	False
Example. One of the Internet Protocol Layers is the Data-Link Layer	T	(F)
1. SSL and its successor TLS provide confidentiality of data from a web client to a web server.	T	F
2. SSL and its successor TLS provide confidentiality of data from a web server to a web client.	T	F
3. SSL and its successor TLS provide integrity of data from a web client to a web server.	T	F
4. SSL and its successor TLS provide integrity of data from a web server to a web client.	T	F
5. SSL and its successor TLS provide end-point authentication of a web server.	T	F
6. SSL and its successor TLS provide end-point authentication of a web client.	T	F
7. SSL and its successor TLS provide VPN connection between a web-server and a web-client.	T	F
8. TCP provides guaranteed message delivery	T	F
9. IPv6 provides guaranteed datagram delivery	T	F
10. Ethernet provides guaranteed frame delivery	T	F
11. Virtual Circuit networking can provide end-to-end guaranteed minimum bandwidth.	T	F
12. Virtual Circuit networking can provide end-to-end guaranteed maximum latency.	T	F
13. IP datagram networking can provide end-to-end guaranteed minimum bandwidth.	T	F
14. IP datagram networking can provide end-to-end guaranteed maximum latency.	T	F
15. IPv4 with Network Address Translation provides the same number of IP addresses as IPv6.	T	F

Blank Page available for working.

END OF EXAMINATION