The University of Western Australia

1st SEMESTER EXAMINATIONS
JUNE 2018

SCHOOL OF COMPUTER SCIENCE & SOFTWARE ENGINEERING

NETWORKS AND SECURITY (CITS3002)

This Paper Contains 5 Pages and 4 Questions
You are required to attempt THREE (3) of the FOUR (4) questions.

Time Allowed: 2 Hours (including reading time)

Do not write verbose answers to any question.
As a guide, a question worth TEN (10) marks should be answered on at most a single page of your answer booklet.

PLEASE NOTE

Examination candidates may only bring authorised materials into the examination room. If a supervisor finds, during the examination, that you have unauthorised material, in whatever form, in the vicinity of your desk or on your person, whether in the examination room or the toilets or en route to/from the toilets, the matter will be reported to the head of school and disciplinary action will normally be taken against you. This action may result in your being deprived of any credit for this examination or even, in some cases, for the whole unit. This will apply regardless of whether the material has been used at the time it is found.

Therefore, any candidate who has brought any unauthorised material whatsoever into the examination room should declare it to the supervisor immediately. Candidates who are uncertain whether any material is authorised should ask the supervisor for clarification.

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1a) Most Australian Internet Service Providers (ISPs) limit the volume of Internet traffic that their customers may both receive from, and transmit to, the Internet.

With reference to one or more diagrams, motivate the need for different traffic shaping mechanisms for different types of users, and describe two distinct traffic shaping policies that an ISP may employ to constrain access to the Internet on a per-user basis.

(10)

1b) The numeric addresses used within a computer network are not numbers simply chosen at random. They have a number of properties that facilitate their use.

With reference to current Internet Protocol (IPv4) addressing scheme, briefly describe three such properties, and explain their role in addressing.

(10)

2a) Explain *why* the Internet Protocol (IPv4) addressing scheme was described as *running out of addresses*.

Describe three distinct mechanisms that are currently being employed to extend the lifespan of IPv4.

(10)

2b) Briefly describe some desirable properties of a robust message digest algorithm.

Outline two distinct examples of how a message digest algorithm may be employed to ensure the integrity of data.

(10)

3a) Draw a diagram showing the packet structure of a single Ethernet packet carrying an HTTP request using TCP/IP.

Highlight all fields that identify any forms of source/destination connectivity.

(10)

3b) The ISO/OSI networking group defined six distinct software mechanisms forming their ISO/OSI Security Architecture. Unfortunately, none of the ISO/OSI Security Architecture recommendations are supported by the core protocols of the TCP/IP internetworking suite.

Briefly describe the recommended security mechanisms, and describe how the use of the TCP/IP protocol suite is slowly evolving to address the ISO/OSI recommendations.

(10)

4a) With the aid of a fully labelled diagram, describe the execution of a *man-in-the-middle* attack.

How could the attack be detected and prevented?

(10)

4b) Of great importance in client/server computing is the speed with which the server process is able to service each client process's request. Depending on the anticipated number of clients and the anticipated time to service each request, the server may adopt a variety of strategies to give each client the impression that its request is being handled immediately.

With the aid of diagrams, outline three distinct models of server process construction. In each case, highlight the advantages and disadvantages of the model.

Note: although you may wish to mention either the Java, C, or Python programming languages in your answer, there is no requirement to provide examples of source code from any programming language.

(10)

END OF PAPER