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Final Exam
DT092G TCP/IP Internetworking

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2018-04-05

Instructions
Carefully read the questions before you start answering them. Note the time limit of the exam and plan
your answers accordingly. Only answer the question, do not write about subjects remotely related to
the question. The questions are not sorted by difficulty. Clearly show which answer you are giving your
solution to, Always motivate your answers and show your calculations.

Time 5 hours.
Exam Aids Non-programmable calculator.
Maximum points 30
Questions 10

Preliminary grades
The following grading criteria applies: E ≥ 13p, D ≥ 16p, C ≥ 18p, B ≥ 21p, A ≥ 24p.

Covered ILO
This exam covers the following Intended Learning Outcomes (ILO)

- ILO: 1 – Analyze and differentiate networking protocols used in TCP/IP protocol suite
- ILO: 2 – Implement the concepts of naming and addressing to Internet IPv4 and their extension
to IPv6
- ILO: 3 – Explain and compare three routing protocols used in the Internet
- ILO: 4 – Explain and exemplify multicast routing
- ILO: 5 – Categorize problems such as reliable transport, data delay, congestion and flow control
and describe at least three congestion control schemes used in TCP
- ILO: 6 – Calculate and measure performance metrics related to throughput, delay, and jitter
- ILO: 8 – Explain the Internet best-effort type of service and its improvements
- ILO: 9 – Explain the principles of queuing theory related to QoS and switching
- ILO: 10 – Explain the principles of multimedia networking and related protocols
Questions

The questions below are not given in any particular order.

(3p) 1. *(ILO: 1)* Which network transport protocol service (TCP or UDP) would you use if you had to develop an online multiplayer game and why?

(3p) 2. *(ILO: 10)* Elaborate on the abbreviation RTP. What does it stand for? What is it used for?

(3p) 3. *(ILO: 2)* What does the abbreviation NAT stand for? What is it used for? How does it work? Explain, use illustrations if necessary.

(3p) 4. *(ILO: 2)* Briefly explain the role of the following protocols: ARP, RARP and ICMP.

(3p) 5. *(ILO: 3)* Explain the major differences between Distance Vector and Link-State Vector routing?

(3p) 6. *(ILO: 4)* What is IGMP and for what purpose is it used?

(3p) 7. *(ILO: 5)* Explain what flow control is used for.

(3p) 8. *(ILO: 6)* Suppose there is a 10 Mbps microwave link between a geostationary satellite and its base station on Earth. Every minute the satellite takes a digital photo and sends it to the base station. Assume a propagation speed of $2.4 \times 10^8$ meters/sec. Recall geostationary satellite is 36,000 kilometers away from earth surface.
   a) What is the propagation delay of the link?
   b) What is the bandwidth-delay product, $R \times d_{prop}$?
   c) Let $x$ denote the size of the photo. What is the minimum value of $x$ for the microwave link to be continuously transmitting?

(3p) 9. *(ILO: 8)* Explain the difference between flooding and controlled flooding.

(3p) 10. *(ILO: 9)* In a small store customers arrive at the rate 40 per hour and they stay in average 4 minutes. What are the average number of customers in the store? (Use Little's Law)