

Qualifying Exam: Network Architecture
July 2013
Date: Friday, 2013/7/5 (1 hour)

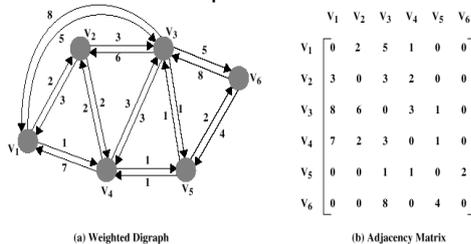
Instruction:

- Put your name and student number on all your answer sheets.
- You have 60 minutes to complete the exam.
- **Show all your work. Partial credit will be considered, if you show intermediate steps in obtaining the answer.**

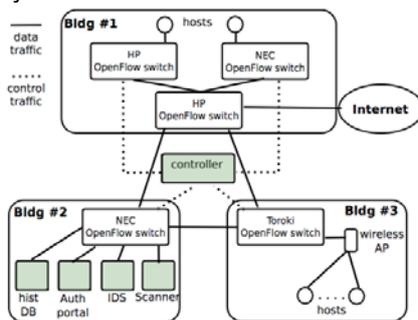
Question #1 (20pt): Key principles of the Internet design are autonomy, best effort service model, stateless routers, and decentralized control. One of main goal of the Internet was survivability. Explain how this goal has been achieved with the key principles of the Internet design.

Question #2 (20pt): Why does “Link state routing” react quicker than “Distance vector routing” when some changes occur in network? (10pt)

Find the shortest path from v1 to each nodes using Dijkstra algorithm. (10pt)



Question #3 (20pt): OpenFlow switches are operating based on “rule-action” with packet classification which is the process of categorizing packets into “flows” in an Internet router. All packets belonging to the same flow obey a predefined rule and are processed in a similar manner (action) by the router. Design access control system in the campus networks shown in following figure using OpenFlow system.



Question #4 (20pt): Retransmission Timeout(RTO) is very important value for congestion control, since TCP consider that network suffers congestion when ACK does not arrives on time, or does not arrive at all within RTO. RTO value is decided based upon RTT. RTT is usually estimated by Exponentially weighted moving average (EWMA). What will happen If RTT is overestimated?(10pt) Jacobson proposed RTT variance estimation. What is the reason behind this proposal?(5pt) How is the RTT variance estimated?(5pt)

Question #5 (20pt): TCP dynamically adapts its rate in response to congestion. UDP does not adapt at all. It causes fairness problem. How can you make UDP traffic TCP-friendly? TCP Friendly Rate Control (TFRC) can be a good candidate as a solution. Explain the mechanism of TFRC or suggest any idea to solve this problem,