

國立臺北科技大學

九十七學年第一學期電機系博士班資格考試

網際網路工程試題

第一頁 共三頁

注意事項：

1. 本試題共【7】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。
4. 考試時間：二小時。

1. (15 points) Recall the macroscopic description of TCP throughput. In the period of time from when the connection's rate varies from $W/(2 RTT)$ to W/RTT , only one packet is lost.
(a) (8 points) Show that the loss rate is equal to

$$L = \frac{1}{\frac{3}{8}W^2 + \frac{3}{4}W}$$

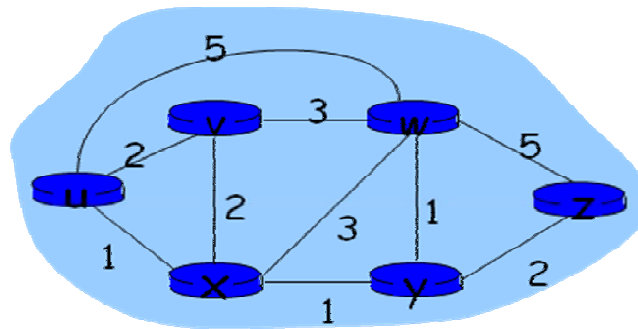
- (b) (7 points) Show that the average rate is approximately given by

$$\frac{1.22 \cdot MSS}{RTT \sqrt{L}}$$

Where MSS is maximum segment size, L is loss rate and RTT is round-trip time.

2. (10 points) Consider the TCP procedure for estimating RTT . Why do you think TCP avoids measuring the *SampleRTT* for retransmitted segments?
3. (15 points) Consider distributing a file of $F = 10$ Gbits to 1000 peers. The server has an upload rate of $u_s = 20$ Mbps, and each peer has a download rate of $d_i = 1$ Mbps and an upload rate of $u = 1$ Mbps. Please find the minimum distribution time for both client-server distribution and P2P distribution.

4. (15 points) Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from u to all network nodes. Show how the algorithm works by computing the following table.



Step	N'	$D(v), p(v)$	$D(w), p(w)$	$D(x), p(x)$	$D(y), p(y)$	$D(z), p(z)$

Where $D(v)$: current value of cost of path from source to destination v .

$p(v)$: predecessor node along path from source to v .

N' : set of nodes whose least cost path definitively known.

5. (15 points) Suppose there are two ISPs providing Wi-Fi access in a particular café, with each ISP operating its own AP and having its own IP address block.
- (a) (8 points) Further suppose that by accident, each ISP has configured its AP to operate over channel 11. Will the 802.11 protocol completely break down in this situation? Discuss what happens when two stations, each associated with a different ISP, attempt to transmit at the same time.
- (b) (7 points) Now suppose that one AP operates over channel 1 and the other over channel 11. Discuss what happens when two stations, each associated with a different ISP, attempt to transmit at the same time.
6. (15 points) Answer the following questions.
- (a) (5 points) Describe the role of the beacon frames in 802.11.
- (b) (5 points) Why are acknowledgments used in 802.11 but not in wired Ethernet?
- (c) (5 points) Why is an ARP query sent within a broadcast frame? Why is ARP response sent within a frame with a specific destination MAC address?

7. (15 points) Assume Web page consists of: I base HTML page (of size O bits) and M images (each of size O bits). Please derive the response time for the following cases:
- (a) (5 points) Non-persistent HTTP.
 - (b) (5 points) Persistent HTTP.
 - (c) (5 points) Non-persistent HTTP with X parallel connections.