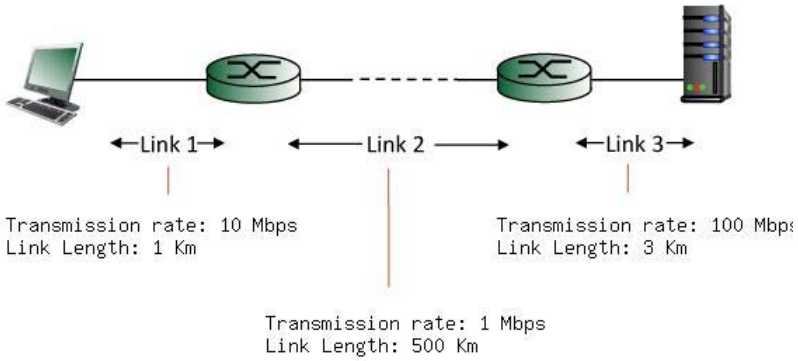
107-1 網路 chapter 1 小考　　學號：----------姓名：----------

1. Consider the figure below, with three links, each with the specified transmission rate and link length.



Find the end-to-end delay (including the transmission delays and propagation delays on each of the three links, but ignoring queueing delays and processing delays) from when the left host begins transmitting the first bit of a packet to the time when the last bit of that packet is received at the server at the right. The speed of light propagation delay on each link is 3x10**8 m/sec. Note that the transmission rates are in Mbps and the link distances are in Km. Assume a packet length of **24000** bits. Give your answer in milliseconds. (要列出 link 1, 2, 3 transmission delays and propagation delays 與全部的 end-to-end delay，共 7 個算式與答案（小數點以下三位，四捨五入）。說明清楚你的算式代表的意義，只寫答案不計分. 3% each, 21% total)

2. Describe four sources of packet delays (2% each delay name, 2% reason of each delay, 16% total)

3. List four access technologies. Classify each one as home access, enterprise access, or wide-area wireless access. (任選四者，配對要正確。寫法：access technologies => home access, enterprise access or wide-area wireless access (4% each, 16% total)

4. How long does it take to send a file of 128,000 bits from host A to host B over a circuit-switched network? Assume (a) all links are 1.024 Mbps. (b) each link uses TDM with 12 slots (c) 1500 msec to establish end-to-end circuit. (要說明清楚你的算式代表的意義，只寫答案不計分. 15%)

5. (a)畫圖說明 source 與 destination 分別如何進行 the encapsulation 與 decapsulation processes of the Internet protocol stack。(5% each, 10% total) (b)需畫出每層，寫出每層名稱(2% each, 10% total)。(c)寫出如何形成每層的資料單位與其資料單位名稱 (3% each, 12% total) (32% total)

1.

Ans:

Link 1 transmission delay = L/R = 24000 bits / 10 Mbps = 2.400 msec. (3%)

Link 1 propagation delay = d/s = 1 Km / 3*10**8 m/sec = 0.003 msec.

Link 2 transmission delay = L/R = 24000 bits / 1 Mbps = 24.000 msec.

Link 2 propagation delay = d/s = 500 Km / 3*10**8 m/sec = 1.667 msec.

Link 3 transmission delay = L/R = 24000 bits / 100 Mbps = 0.240 msec.

Link 3 propagation delay = d/s = 3 Km / 3*10**8 m/sec = 0.010 msec.

Thus, the total end-to-end delay is the sum of these six delays: 28.320 msecs.

(3% each, 21% total)

2.

Ans:

(a) nodel processing delay: check bit errors, determine output link

(b) queueing delay: time waiting at output link for transmission, depends on congestion level of router

(c) transmission delay: R=link bandwidth (bps) L=packet length (bits), time to send bits into link = L/R

(d) propagation delay: d = length of physical link, s = propagation speed in medium, propagation delay = d/s

(2% each delay name, 2% reason of each delay, 16% total)

3.

Ans: (任選四者，配對要正確) (16% total)

1. Dial-up modem over telephone line: home; (4%)
2. DSL over telephone line: home or small office; (4%)
3. Cable to HFC: home;
4. 100 Mbps switched Ethernet: enterprise;
5. Wifi (802.11): home and enterprise:
6. 3G and 4G: wide-area wireless.

4.

Ans: 1500ms + 64,000/(2.048*106*1/24)s = 1.5s + 1.5 s =3.0 s (4%)

1500ms: The circuit-switched network has to establish end-to-end circuit (3%)

use 1 of 12 slots, bandwidth R = $1.024*10^6/12$ (4%)

128,000/($1.024*10^6$*1/12) = 1.5 s : packet length L/ bandwidth R (4%)

(15% total)

5.

Ans:

(a)

application

transport

network

link

physical (2% each layer's name 10% total)

(b)

application layer: message

transport layer: segment
network layer: datagram
link layer: frame
(3% each, 12% total)

(c)

Source encapsulation process:上層的資料單位送到下層，由下層在上層的資料單位前面加下層的 header，形成下層的資料單位。

Destination decapsulation process: 下層將下層的資料單位取出此層的 header 處理後，將剩餘的資料（即上層的資料單位）送到上層。(5% each, 10% total)

圖要正確！