IT3031: Communication Systems Quiz#1 Date: March 27, 2012

1. Explain the following terminologies: (20 pts)
   (a) telecommunication 使用電磁波進行通訊，內容可為數位或類比
   (b) data communication 使用數位資料進行傳輸
   (c) baseband 通訊之訊息包含 frequency zero 之訊號
   (d) bandwidth (in physical layer) 最高頻減最低頻之差值（頻率之帶寬）
   (e) bandwidth (in data link layer) 每單位時間可傳送之 bit 數
2. Compare the difference between 'analog' and 'digit.' (10 pts)
3. Assume, in vacuum, light is propagated with a speed 3×10^8 m/s. Let the light be carried into a frequency of 4 MHz. Please calculate the wavelength of the light in air. (10 pts)
4. The period of a signal is 100 ms. What is its frequency in kilohertz? (10 pts)
5. If a periodic signal is decomposed into five sine waves with frequencies of 100, 300, 500, 700, and 900 Hz, what is its bandwidth? Draw the spectrum, assuming all components have a maximum amplitude of 10 V. (20 pts)
6. Draw the time and frequency domains of a nonperiodic signal. Assume the y-axis represents the amplitude in your each plot. (15 pts)
7. Draw the time and frequency domains of a periodic signal. Assume the y-axis represents the amplitude in your each plot. (15 pts)

2. Analog：可由任何定義(無限)的資料數值所構成，所呈現的形式為一連續波型

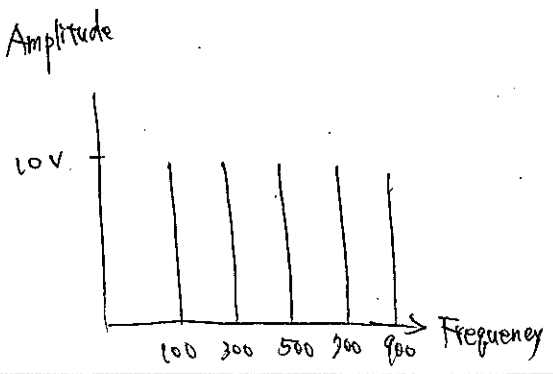
Digit：由有限定義的資料數值所構成，所呈現的形式為不連續波型

3. $v = f \cdot \lambda$

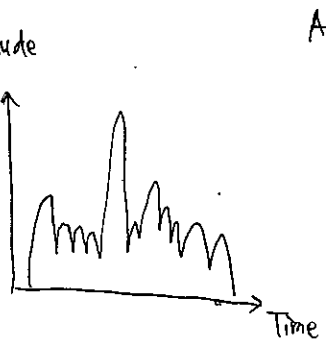
$$\lambda = \frac{3 \times 10^8 \text{ m/sec}}{4 \times 10^6 \text{ wave/sec}} = \frac{3 \times 10^2}{4} = 75 \text{ meters}$$

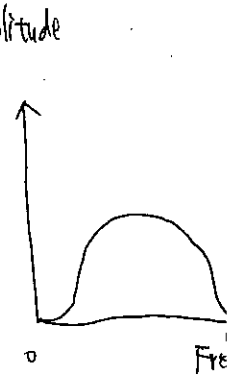
4. $$f = \frac{1}{T} = \frac{1}{100\text{ ms}} = \frac{1}{0.1} = 10\text{Hz} = 10^{-2}\text{kHz}$$

5. $f_H - f_L = 900 - 100 = 800$ Hz



6.





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