

# CSE3020 Network Technology

## Semester 1, 2004

### Tutorial 2 -Week 3

**Question T2.1** - If the solid curve in Figure 1 represents  $\sin(2\pi t)$ , what does the dotted curve represent? That is, the dotted curve can be written in the form:  $A\sin(2\pi f t + \phi)$ ; what are  $A$ ,  $f$  and  $\phi$ ?

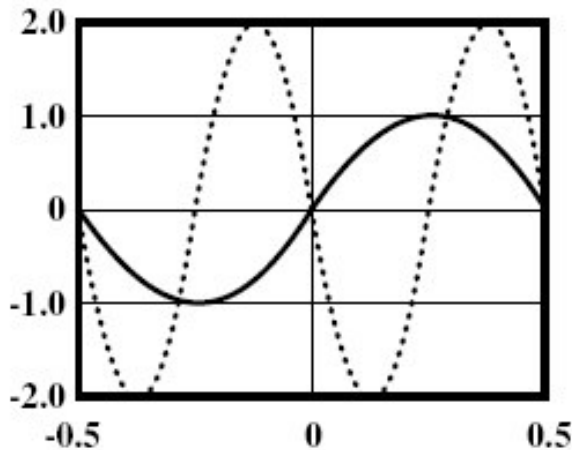


Figure 1: Sine plots for Question T2.1.

**Question T2.2** - If given the following signal:  
 $s(t) = 20 + 40\sin(200\pi t) + 20\sin(600\pi t) + 90\sin(400\pi t)$ ;  
plot its amplitude frequency-domain function,  $S(f)$ . What is the bandwidth of the signal?

**Question T2.3** - Briefly discuss why a frequency-domain analysis of communications signals is important as compare with a time-domain analysis?

**Question T2.4** - Study the works of Shannon and Nyquist on channel capacity. Each places an upper limit on the bit rate of a channel based on two different approaches. How are the two related.

**Question T2.5** - Given a channel with an intended capacity of 50 Mbps, and the bandwidth is 5 MHz. According to Shannon, what signal-to-noise ratio is required to achieve this capacity?

**Question T2.6** - A digital system is required to operate at 19,200 bps.

- (a) How many signaling levels are required if the channel bandwidth is 1920 Hz?
- (b) If a signal element encodes a 6-bit word, what is the minimum required bandwidth of the channel?