

King Fahd University of Petroleum and Minerals
College of Computer Sciences and Engineering
Department of Computer Engineering

COE 341 – Data & Computer Communications (T111)

Homework # 01 (due date: Sunday 16/10/2011 during class period)

***** Show all your work. No credit will be given if work is not shown! *****

Problem # 1 (20 points): Write the following signal in the form $x(t) = A \sin(2\pi f_0 t + \phi)$. Also, find out the **amplitude (A)**, the **frequency (f_0)** and the **phase (ϕ)** for the signal.

$$x(t) = \frac{\sqrt{2}}{2} \cos\left(400t + \frac{\pi}{5}\right) + \frac{\sqrt{2}}{2} \sin\left(400t + \frac{\pi}{5}\right) \quad , \text{ (hint: } \sin\left(\frac{\pi}{4}\right) = \cos\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2} \text{)}$$

Problem # 2 (10 points): Find the bandwidth for the following function:

$$s(t) = 50 \cos(16\pi t) - 500 \sin(2400\pi t) + 300 \sin(4\pi t)$$

Problem # 3 (70 points): Consider the “Sawtooth” wave function listed in table A.1 of Appendix A (page 838) of the text book. Find the effective bandwidth of the transmitted signal such that it contains at least 95% of the total power of the original signal. (Starting with the mathematical expression of the function show **all** steps of derivation).