

## COE 342, Term 012

### Data & Computer Communications

#### HW# 1

**Q.1.** Problem 3.4.

**Q.2.** Problem 3.11.

**Q.3.** Problem 3.13.

**Q.4.** Problem 3.14.

**Q.5.** Problem 3.15.

**Q.6.** Problem 3.17.

**Q.7.** Problem 3.19.

**Q.8.** Problem 3.20.

**Q.9.** Problem 3.21.

**Q.10.** Problem 3.22.

**Q.11.** Given a periodic signal  $s(t)$  whose Fourier series expression is given below :

$$s(t) = \sum_{n=1}^{\infty} b_n \sin(2000n\pi t), \text{ where } b_n = 2A(1 - (-1)^n)/(500n\pi)$$

(i) What is the fundamental frequency of  $s(t)$ .

(ii) What is the bandwidth of  $s(t)$ .

(iii) Does  $s(t)$  have a line spectrum or a continuous spectrum.

**Q.12.** Assume that the signal  $s(t)$  in **Q.11** is transmitted through a voice-grade telephone line (cut-off frequency of 4KHz). Assume that  $A=5$  Volts and that signal attenuation is independent of frequency and is equal to 10 dB/Km. Suppose that an amplifier with gain equal to 6 dB is inserted after 2 Km.

(i) Give an expression of the voltage signal  $s(t)$  at the input of the amplifier.

(ii) Give an expression of the voltage signal  $s(t)$  at the output of the amplifier.