KFUPM - COMPUTER ENGINEERING DEPARTMENT

COE-241 – Data and Computer Communication

Quiz 3 – Due date: Oct 22nd, 2013

Student Name:

Student Number:

Problem (100 point) Consider the periodic signal $s(t)$ shown in the figure below. Assume $A = 5$ volts and $T = 2$ second.

a) (5 points) Write a mathematical representation for $s(t)$.

b) (5 points) Is $s(t)$ analog or discrete and why? What is the period of the function $s(t)$? What is the fundamental frequency for $s(t)$?

c) (5 points) Compute the DC component of $s(t)$.

d) (5 points) Compute fmin and fmax and determine the bandwidth of $s(t)$.

e) (5 points) Compute the power of $s(t)$.

f) (25 points) Find the Fourier series expansion of $s(t)$.

g) (10 points) Compute the power using the Fourier Series expansion and show that is it equal to that obtained in part (e)

h) (20 points) $s(t)$ has infinite bandwidth (line spectrum) and it is required to truncate it such that it has a limited bandwidth but still has 90% of the original power. What terms of the original series expansion should be included? Produce a table similar to that in slides shown in class on Fourier Series Expansion (slide 78). Show the percent of power as the number of terms in $s\_e(n = k)$ are increased.

i) (5 points) What is the new bandwidth and power of the new truncated series?

j) (15 points) Specify the power spectral density (PSD) function for $s(t)$.