KFUPM - COMPUTER ENGINEERING DEPARTMENT

COE-341 – Data and Computer Communication

Assignment 1 – Due date: March 22th, 2010 (Note the deadline change!!)

Student Name:
Student Number:

Problem 1 (20 points) The services between adjacent layers in the OSI architecture are expressed in terms of primitives. To transfer a packet data unit (PDU) from layer N to its peer layer at the other end system, a specified sequence of service primitives must be executed.

a) List these service primitives and explain briefly the purpose of each?

b) Assume a confirmed service type – Specify the sequence execution order using a diagram similar to that in class notes slide 19.

c) Assume a non-confirmed service type – Specify the sequence execution order using a diagram similar to that in class notes slide 19.

Problem 2 (20 points) On the context Internet Protocol:

a) Discuss briefly the main differences between Transport Control Protocol (TCP) and User Datagram Protocol (UDP).

b) Discuss very briefly the main differences between IPv4 and IPv6.

Problem 3 (100 points) Consider the periodic signal $s(t)$ shown in the figure below. Assume $A = 1$ volts and $T = 1$ 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 $s(t)$.

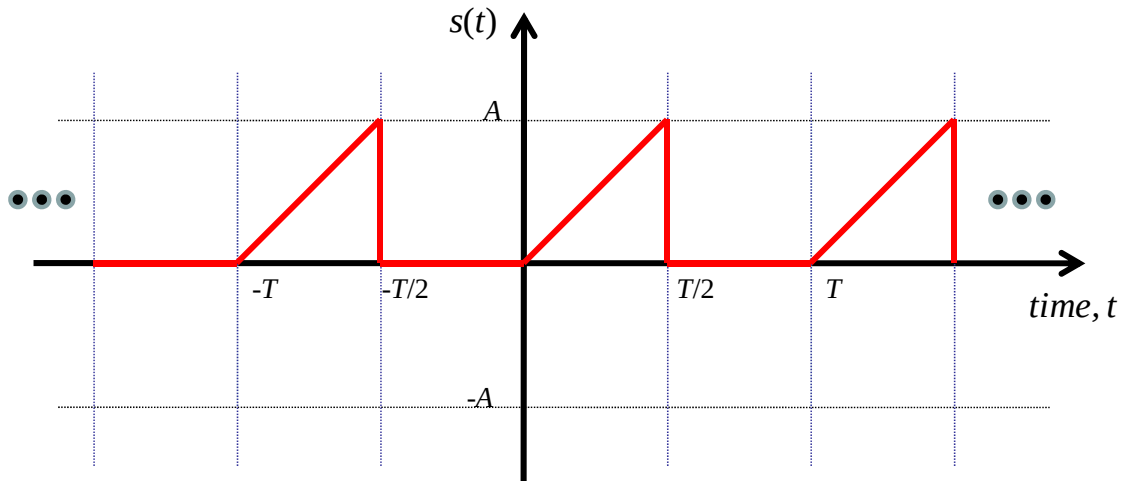
f) (30 points) Find the Fourier series expansion of $s(t)$.

g) (5 points) Specify the terms containing frequencies lower than the fundamental frequency and those containing frequencies higher than the fundamental frequency.

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

i) (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 95% 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.

j) (10 points) What is the new bandwidth and power of the new truncated series?



Problem 4 (10 points): Consider the full-wave rectified cosine function shown in Appendix A (page 838) of textbook. For the SPECIFIED periodic signal in the textbook do the following:

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

b) Plot the signal $s(t)$ for t between $-T$ and T and provide a list of the Matlab code used to produce the plot..