## ENEE 425

Homework #5

## Section 0101

- 1) For each of the following signals, using the definition of the Z transform, compute the Z transform, its region of convergence (ROC), its the zeros and poles. Sketch the ROC and the locations of zeros and poles. Check also for zeros and poles at  $|z| = \infty$  (i.e. check to see if  $\lim X(z) = 0$  or  $\infty$ ).
  - a) x[n] = u[n-1]
  - b) x[n] = u[n+1]
  - c) x[n] = u[-n-1]
  - d) x[n] = u[-n+1]
  - e) Which of these signals is zero for all the past (n < 0)? Which of these signals is zero for an infinite number of points in the past?
- 2) For each of the following signals, compute the Z transform, its ROC, its the zeros and poles. Sketch the ROC and the locations of zeros and poles. Check also for zeros and poles at  $|z| = \infty$ .
  - a)  $x[n] = u[n]\sin\left(\frac{2\pi}{N}n\right)$ . For the sketch only, assume N = 3.
  - b)  $x[n] = a^{|n|}$  where a > 1 (hint: use the identity  $a^{|n|} = a^n u[n] + a^{-n} u[-n-1]$ )
  - c)  $x[n] = a^{|n|}$  where 0 < a < 1
- 3) For each of the following signals, compute the Z transform, its ROC, its the zeros and poles. Sketch the ROC and the locations of zeros and poles. Check also for zeros and poles at |z| = ∞. If the Z transform does not exist, (i.e. the ROC is the null set), point this out. Assume b > 0 for the sketches.

a) 
$$x[n] = u[n](b/6)^n + u[n](b/4)^n$$

- b)  $x[n] = u[n](b/6)^n + u[-n-1](b/4)^n$
- c)  $x[n] = u[-n-1](b/6)^n + u[n](b/4)^n$
- d)  $x[n] = u[-n-1](b/6)^n + u[-n-1](b/4)^n$
- e)  $x[n] = (u[n] u[n-2])(b/6)^n$