# KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
## ELECTRICAL ENGINEERING DEPARTMENT

### EE406- SIGNAL PROCESING
### FALL SEMESTER 2003-2004

### PROJECT #2

**Due Date: January 3rd, 2004**

## Problem 1

*Consider the rectangular pulse $x(n) = u(n) - u(n - 10)$ acting as an input to an LTI system with the impulse response $h(n) = (0.9)^n u(n)$.*

*Determine the output $y(n) = x(n) * h(n)$.*

## Problem 2

*As in discrete-time Fourier transform, the Z-transform also had its properties and one of the more important is the convolution property which is going to be demonstrated below:*

*Let $X_1(z) = 1 + 2z^{-1} + 3z^{-2}$ and $X_2(z) = 4 + 5z^{-1} + 6z^{-2} + 7z^{-3}$*

*Thus, determine $X_3(z) = X_1(z)\, X_2(z)$*

## Problem 3

*To show the relationship between convolution and deconvolution, we use the same equation as in prvious problem but this time we take the resultant $X_3(z)$ to divide by the $X_2(z)$.*

*Hence,*

$$X_3(z) = 4 + 13z^{-1} + 28z^{-2} + 34z^{-3} + 32z^{-4} + 21z^{-5}$$

$$X_2(z) = 4 + 5z^{-1} + 6z^{-2} + 7z^{-3}$$

## Problem 4

*Compute the inverse Z-transform of*

$$X(z) = 1 / ( 1 - 0.9\, z^{-1} )^2 ( 1 + 0.9\, z^{-1} )$$

*where $|Z| > 0.9$*