Problem 1 [8 marks]

Given $x(n)$ as drawn in the figure, sketch the following signals

a) $y(n) = x(3n)$ [1.5 marks]
b) The even and odd parts of $x(n)$  [5 marks]
c) Determine the energy and the power of $x(n)$. Is $x(n)$ an energy or power signal? [1.5 marks]
Problem 3  
[11 marks]

a) Determine whether or not each of the following signals is periodic. In case of periodic signals, find the fundamental period?

i) $x(n) = 4 \cos(5n + \frac{\pi}{6})$ [1 marks]

ii) $x(n) = 4 \cos(\frac{\pi}{2}n) - \sin(\frac{\pi}{8}n) + 3 \cos(\frac{\pi}{4} + \frac{\pi}{3})$ [2 marks]
b) A discrete system can be
   1) static or dynamic (1 mark)
   2) linear or nonlinear (2 mark)
   3) causal or non causal (1.5 mark)
   4) stable or not stable (1.5 mark)
   5) time variant or time invariant (2 mark)

Examine the following system with respect to the properties above,
\[ y(n) = \tan(x(n)) \]

* To get the mark you have to state the reason for it.
Problem 3 [11 marks]

If an LTI system can be described by the following linear difference equation,

\[ y(n) - 0.5y[n-2] = 2x(n) - x(n-2) \]

A) Draw the corresponding direct-form-II structure [2 marks]

B) If \( y(-1) = 1, y(-2) = 0 \), and \( x(n) = 2^n u(n) \), by using \( z^- \)-transform find the output \( y(n) \) [9 marks]