



Answer the following questions: [15 Marks]

1- Signal Manipulation [6 Marks]

A. Determine whether or not the signal below is periodic and if it is periodic, determine the fundamental period [2 Marks]:

- $x(n) = \cos\left(\frac{n\pi}{6}\right) + \operatorname{Re}\left[e^{\frac{jn\pi}{8}}\right] + \operatorname{Im}\left[e^{\frac{jn\pi}{12}}\right]$

B. Given the sequence $x(n) = (5 - n)[u(n+2) - u(n - 3)]$, make a sketch of [4 Marks]:

- $y_1(n) = x(2n - 2)$
- $y_2(n) = x(2 - 2n)$
- *Even part and the odd part.*

2. Discrete Time Systems [3 Marks]

For the system below:

$$y(n) = x(n) + ([x(n+1) + x(n-1)] / x(n))$$

Determine whether or not the system is:

- Additive.
- Homogeneous.
- Linear.
- Shift invariant.
- Causal.
- LSI.

3. Convolution and DTFT [6 Marks]

Convolve

$x(n) = \cos(n\pi/2) [u(n) - u(n-4)]$ with
 $h(n) = (5 - n)[u(n+2) - u(n - 3)]$ and sketch $x(n)$, $h(n)$ and $y(n)$.

*Good luck
Dr. Michael Nasief*