For all homework throughout the semester you must do the following:

1. Explain in your own words what is being asked.
2. State your strategy for arriving at the solution.
3. Execute your strategy noting the steps.
4. ✎ Write legibly and in a logical order.

For each problem, we provide the approximate percentage of points.

Problem 1 [40 %]

1. Determine the even sequence $x[n]$ which has the following z-transform
$$X(z) = \frac{z^{-1}}{1 - 2.5z^{-1} + z^{-2}}. \tag{1}$$
2. Let $y[n]$ be an even sequence, and let $Y(z)$ be the z-transform of $y[n]$. Show that if the region of convergence of $Y(z)$ is not empty, then it has the form
$$R < |z| < R^{-1}, \quad 0 \leq R \leq 1. \tag{2}$$

Problem 2 [40 %]

We consider the filter with impulse response $h[n]$ defined by
$$H(z) = \frac{z^{-1} - a^*}{1 - az^{-1}}. \tag{3}$$
You are told that the filter $G(z)$ defined by $g[n] = h[2n]$ satisfies
$$|G(e^{j\omega})| = 1.$$

1. Show that $h[n] = c\delta[n - n_0]$, where c is some constant, and n_0 some integer (i.e. H is a pure delay).

Problems from the textbook [5 x 4 % = 20%]

Solve the following problems from the textbook:

- 3.30
- 3.32
- 3.37
- 3.39
- 3.45