Question3

The **Kuwahara filter** is a non-linear, edge-preserving smoothing filter used primarily in image processing to reduce noise while preserving edges. It is particularly effective in artistic image processing and stylization because it smooths regions within an image without blurring the edges, making it a popular choice for cartoon-like effects.

Key Characteristics:

1. **Edge-Preserving**: Unlike traditional smoothing filters (like Gaussian or mean filters), which may blur both edges and details, the Kuwahara filter preserves edges by performing smoothing in a more localized and selective manner.
2. **Partitioning the Neighborhood**:
    - The Kuwahara filter divides a pixel's local neighborhood (typically a 5x5 window) into four overlapping subregions.
    - For each subregion, it calculates the mean and variance (or standard deviation).
    - The filter then selects the subregion with the lowest variance, assuming that this subregion is most homogeneous and less likely to contain an edge or detail.
3. **Output Pixel**:
    - The final value of the central pixel is replaced by the mean intensity of the subregion with the lowest variance.
    - This approach allows for noise reduction in flat regions while preserving sharp transitions (edges) between regions.

Output: