A suitable new quantization table:

$$Q_{new}(u,v)=\begin{bmatrix} 10 & 30 & 40 & 50 \\ 30 & 40 & 50 & 60 \\ 40 & 50 & 60 & 70 \\ 50 & 60 & 70 & 80 \end{bmatrix}$$

The new quantization table has larger coefficients when compared to the old table. Further, the value of the coefficients increases with respect to increasing vertical, horizontal, and diagonal spatial frequencies. The larger stepsize will tend to force quantized coefficients of higher spatial-frequency components to become zero. Hence the subsequent run-length coding and Huffman coding will be more effective in compressing the image, leading to higher compression ratio.

With the new quantization table, the reconstruction error for the decompressed images will tend to be larger as more information is likely to be lost due to the larger quantization stepsize. In order words, the approximated quantized coefficients have larger errors for the new table.

(c)(ii)

Image $g(i,j)$ has more high-frequency contents than $f(i,j)$ as it has more variations in the spatial domain. This implies that the 2-D DCT coefficients of $g(i,j)$ corresponding to high spatial frequencies will tend to have larger values. This in turn suggests that the quantized coefficients at the high spatial frequencies are less likely to be zero compared to that of $f(i,j)$. Therefore, the subsequent run-length and Huffman coding are less effective in compressing $g(i,j)$. As a result, the image $g(i,j)$ will have lower compression ratio than $f(i,j)$.