

Theory
Ques 2

$N \times N$ image where each pixel is (R, G, B) stored with 8 bits of precision.

For each pixel, no. of bits required
 $= 8 \times 3 = 24$

Since image has $N \times N$ pixels,
so for $N \times N$ pixels, bits required
 $= N \times N \times 24$
 $= N^2 \times 24$

Using results of k means for compression,
For one pixel, bits required $= \log_2 k$
(where $k = \#$ clusters)

Bits
for
mapping

For $N \times N$ pixels, bits required
 $= N \times N \times \log_2 k$
 $= N^2 \times \log_2 k$

Now, for one image, the bits required
(using k means compression) $= N^2 \log_2 k + 24k$

So, Compression ratio $= \frac{\text{Size of uncompressed image}}{\text{Size of compressed image}}$
 $= \left[N^2 \times 24 : N^2 \log_2 k + 24k \right]$