State University of New York at Buffalo
CSE 534 Spring 2017 Homework Set #3

Assignment Date: Thursday April 13, 2017; Due: ***Thursday , April 27, 2017 at 11:59pm***

Name: _____ Student Number: _____

Problem (1) **(Digital Image Coding – A Hands-on Exercise)**

This exercise is intended to practice as encoding of digital image created by each student using mobile devices. You may use any programming language to implement the encoding process. Proper displays of the image signals at various stage of image creation, color conversion, transform, quantization, encoding, and reconstruction are also required. Each student is required to complete the following steps:

(a) Image Preparation:
   i) Take three pictures, one outdoor, one indoor, and one portrait of your own, with appropriate resolution selection (**original color images are to be submitted**)
   ii) Convert the color images to grey scale images using the lossless color conversion formula; only grey scale images are used in this homework set. (**converted grey scale images are to be submitted**)
   iii) Subsample the original images properly and convert them (potentially additional crop) into 1024 × 1024 image (**subsampled images are to be submitted**)

(b) Image Encoding:
   For each 1024 × 1024 image, perform the following:
   i) For each 8 × 8 block, perform DCT transform, quantization, and entropy coding; Standard JPEG routines may be called to carry out these operations.
   ii) Three different quantization settings should be selected and applied to each image
   iii) Standard JPEG entropy coding tables are to be used for encoding the quantized DCT coefficients
   iv) Compute the total bits used for each image and calculate the compression ratio
   v) Explanations should be given for the selection of quantization tables

(c) Image Decoding/Reconstruction:
   i) Reconstruct all three images based on the bitstreams generated from image encoding (**All three reconstructed images are to be submitted**)
   ii) Compute the PSNR of the reconstructed images (**PSNR values are to be submitted**)
   iii) Discussion on the selection of quantization settings on the compression ratio (original size over compressed size) (**Discussions are to be submitted**)
   iv) Discussion on the selection of quantization settings on the quality of compressed images (**Discussions are to be submitted**)

(d) Brief report including all "to be submitted" items as well as all runnable codes and reference codes should be submitted.

(e) **Important Notice:** Only standard commercial software functions may be called. Any routines developed by any individual cannot be called or adopted.