The code for HW1 is separated into question\_1.py、question\_2.py and question\_3.py to represent each question in HW1. I have written my function in function.py for question\_1.py、question\_2.py and question\_3.py to use. I have written environment information in requirements.txt.

Question 1

fig.1 transforms “foreman\_qcif\_0\_rgb.bmp” from the RGB to YCbCr420 color space

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| Fig. 1 |

Fig. 2 is a Y image from Ycbcr420、Fig. 3 is a cb image from Ycbcr420 and Fig. 4 is a cr image from Ycbcr420

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| Fig. 2 | Fig. 3 | Fig. 4 |

Fig. 5 is the “foreman\_qcif\_0\_rgb.bmp” Original image and Fig. 6 is the “foreman\_qcif\_0\_rgb.bmp” subsampled version of the image in the RGB color space. I can’t tell the difference between Fig.5 and Fig.6

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| Fig. 5 | Fig. 6 |

Question 2

I have transformed “foreman\_qcif\_0\_rgb.bmp,” “foreman\_qcif\_1\_rgb.bmp,” and “foreman\_qcif\_2\_rgb.bmp” from the RGB to YCbCr color space. I save 4:2:0 YCbCr format in the file ‘question2\_with\_subsampling.yuv’ and 4:4:4 YCbCr format in the file ‘question2\_without\_subsampling.yuv’. Fig7~9 are file ‘question2\_without\_subsampling.yuv’ open in YUVDisplay.exe. Fig10~12 are file ‘question2\_without\_subsampling.yuv’ open in YUVDisplay.exe.

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| Fig. 7 | Fig. 8 | Fig. 9 |

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| Fig. 10 | Fig. 11 | Fig. 12 |

Question 3

I read the file ‘question2\_without\_subsampling.yuv’ to get 3 YCbCr frames and quantify all possible intensities evenly in 8 levels. Fig. 13 is the Huffman tree in question 3. Fig. 14 is the table for Huffman coding with code, symbol, and probability.Fig. 15~17 are the YCbCr frames after Huffman decoding and dequantization.

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| Fig. 13 | Fig. 14 |

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| Fig. 15 | Fig. 16 | Fig. 17 |