Image Processing (7CS155)

Important instructions:

-Complete the assignments before deadline (Nov 6, 2020)

-You should write your roll no., name and contact detail (email and mobile no.) on the first page of your answer sheet.

-Your answer will be handwritten and pdf scan copy of the answer sheet will be uploaded on MS team

-Numerical solutions may call for presentation in the class

Assignment#3

1. Discuss the different property of DCT. Apply DCT on following image

$$\begin{bmatrix}13 & 12\\ 11 & 12\end{bmatrix} \text{ and } \begin{bmatrix}90 & 100\\ 100 & 105\end{bmatrix}$$

2. Two image segment $f_1(m,n)\ and f_2(m,n)$. Prove the additive property of Fourier transforms

$$f_1(m,n) = \begin{bmatrix}2&2&2&2\\2&2&2&2\\2&2&2&2\\2&2&2&2\end{bmatrix} \text{ and } f_2(m,n) = \begin{bmatrix}4&4&4&4\\4&4&4&4\\4&4&4&4\\4&4&4&4\end{bmatrix}$$

That is prove $DFT\{f_1(m,n)\} + DFT\{f_2(m,n)\} = DFT\{f_1(m,n) + f_2(m,n)\}$

3. Discuss the five different properties of DFT?
4. Compute the 2D DFT of 4×4 gray scale image

$$\text{f(m,n)} \begin{bmatrix}1&1&1&1\\1&1&1&1\\1&1&1&1\\1&1&1&1\end{bmatrix}$$

5. Determine the constant P,Q,R, S and T such that the 2D DFT of the signal f(m,n) can be expressed as $F(k,l) = P\sum_{m=0}^{Q}\sum_{n=0}^{R} f(m,n)e^{-j(Smk+Tnl)}$
6. Compute the Haar basis for N= 4?
7. Discuss the merits and demerits of Haar transform. Compute 2D transform of the signal f(m,n)

$$\begin{bmatrix}2&4\\0&6\end{bmatrix}$$

8. Compute the SVD of the matrix $X = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ -1 & 1 \end{bmatrix}$
9. Discuss the importance of color image processing?
10. Discuss the different types of color model? Write the mathematical formula to convert one color model to other.
11. Write the algorithmic steps for gamma correction? Perform the gamma correction of the image at gamma =0.5

$$\begin{bmatrix} 2 & 4 & 6 & 8 \\ 3 & 5 & 7 & 9 \\ 4 & 6 & 8 & 10 \\ 12 & 14 & 15 & 13 \end{bmatrix}$$

12. What is meant by pseudo-colouring? For what purpose is it useful? Explain how a pseudo coloured image can be obtained.

13. Compute the median value of marked pixel shown in Fig using 3×3 mask

$$\begin{bmatrix} 18 & 22 & 33 & 25 & 32 & 24 \\ 34 & (128) & (24) & (172) & (26) & 23 \\ 22 & 19 & 32 & 31 & 28 & 26 \end{bmatrix}$$

14. Write the short notes on following with suitable examples

a) FFT and STFT
b) Image Enhancement
c) Median Filter
d) Image restoration and denoising
e) Image segmentation and its approaches
f) DWT and it better than DCT.