Department of Computer Science and Engineering, NIT Calicut
CS4093D IMAGE PROCESSING LABORATORY
Winter Semester 2021 - Test II - 18th March 2021

Max Marks - 15 **Total time - 2 hrs**

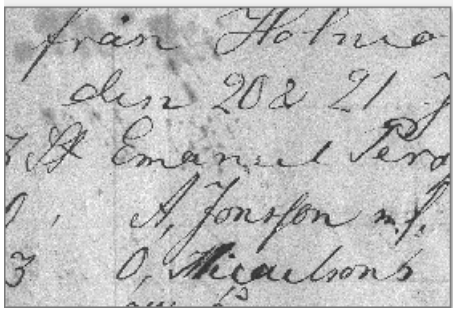
Question 1 is mandatory.
You can choose 2 questions from question numbers 2 to 5.

1. Write a function to implement 2D convolution of 2 matrices of size $m1 * n1$ and $m2 * n2$. Illustrate with a suitable example. **[3+2 = 5 Marks]**

2. Propose a set of intensity-slicing transformations capable of producing all the individual bit planes of an 8 bit monochrome image.(For Example, a transformation function with the property T(r)=0 for r in the range [0, 127] and T(r) = 255 for r in the range [128, 255] produces an image corresponding to the 8^{th} bit plane in an 8-bit image).

   Apply bit plane slicing; then display images after each bit plane is removed. which is the most crucial bit plane? (If removing a bit plane causes serious damage to the visual quality of the image, then that bit plane is considered crucial). **[2+2+1 = 5 Marks]**

3. When old documents are scanned, it is sometimes difficult to read the text. Is it possible to increase the contrast between the text and background? What steps can be taken to further increase the image quality? Illustrate with histograms and resultant images. Describe what kind of experiments you have done! **[1+2+2 = 5 Marks]**



4. Design a spatial domain filter to preserve only the high frequency information in the below image. **[1+2+2 = 5 Marks]**

$$\begin{bmatrix} 2 & 2 & 2 & 2 \\ 8 & 8 & 8 & 8 \\ 2 & 2 & 2 & 2 \\ 8 & 8 & 8 & 8 \end{bmatrix}$$

5. Verify the effect of an $n * n$ averaging filter on the below image. Show the resultant images for $n =$ 3, 5, 7, and 11 and 25. Report your observations. **[1+2+2 = 5 Marks]**