Roll No.:……

National Institute of Technology, Hamirpur (HP)

Name of the Examination: M.Tech.

Branch	**:Signal Processing & Control**	**Semester**	**:1st**
Course Name	**:Digital Image Processing & Pattern Recognition**	**Course Code**	**: EE-731**

Time: 2 Hours **Maximum Marks: 50**

Note :

1. **All Questions are compulsory**
2. **Draw the relevant diagrams/figures**
3. **Assume data wherever required**
4. **Write your Name, Roll No, mobile number and date of birth on the Answer sheet. (Evaluations will be strictly based on these values)**

Q1. (a) Consider a sub-image $f[m, n]$ of size 3 X 3 whose pixel values, i.e. elements of 2D function, are similar to your mobile number such that suppose your mobile number is 84282-32834, the sub-image formed is

$$f[m,n]=\begin{bmatrix}4 & 3 & 8\\ 2 & 3 & 2\\ 8 & 2 & 4\end{bmatrix} \qquad h[m,n]=\begin{bmatrix}9 & 7 & 1\\ 2 & 2 & 2\\ 1 & 7 & 9\end{bmatrix}$$

The image is degraded by a system with degradation function whose values are based on your date of birth. Suppose your date of birth (DOB) is 01/02/1997 then the degradation function is $h[m, n]$ as given above. Obtain the degraded image.

(b) Perform histogram equalization of the image shown below

$$I=\begin{bmatrix}4 & 4 & 4 & 4 & 4\\ 3 & 4 & 5 & 4 & 3\\ 3 & 5 & 5 & 5 & 3\\ 3 & 4 & 5 & 4 & 3\\ 4 & 4 & 4 & 4 & 4\end{bmatrix}$$

(5+5)

Q2. (a)Suppose your Roll No. is 20MEE108 and date of birth (DOB) is 07/03/1998. Create a sub-image as shown below using numbers from your roll no. Compute the degree of compression that can be achieved using Huffman coding of the pixels

$$\begin{bmatrix}8 & 8 & 8 & 1\\ 1 & 8 & 8 & 8\\ 8 & 1 & 1 & 1\\ 1 & 2 & 2 & 0\end{bmatrix}$$

(b) Write a short note on

i. Adaptive noise reduction filter (odd roll nos)

ii. Adaptive median filter (even roll nos)

P.T.O

Q3. (a)Encode the following 4X4 8-bit image of vertical edge using the LZW coding. Also employ the decoding algorithm to obtain the original image.

39	39	126	126
39	39	126	126
39	39	126	126
39	39	126	126

(b) Explain the JPEG compression algorithm using the block diagram of transform coding. **(5+5)**

Q4. (a) Obtain the Haar transformation matrix for N= 8 (odd roll nos)/4(even roll nos). Mention the relevant steps.

(b) Explain with an example Generalized Hough transform approach for line detection. Use flow chart or step by step procedure to explain the approach. **(5+5)**

Q5. (a) Compare the different color models, highlighting their utility and the formulae used for inter-conversion i.e. one color model to another.

(b) Consider an image which has been named using your name say, yourname.jpg (akshay.jpg). Write a Matlab code to convert the given image to grayscale (gi), corrupt this image with salt & pepper noise to obtain a noisy image (ni), filter the noisy image (ni) using averaging filter to obtain filtered image (si) and another filtered output using median filter (mi). Also perform histogram equalization on the grayscale image (gi) to obtain histogram equalized image (hi). Display original image, gi, ni, si, mi, and hi in the same figure window. **(5+5)**