Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII (NEW) EXAMINATION – WINTER 2017

Subject Code: 2181102 Date: 10/11/2017

Subject Name: Fandamental of Image Processing(Departmental Elective - III)

Time:02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	List applications of digital image processing in Engineering and medical field.	**03**
	(b)	What is computer vision? Explain components of image processing system with help of block diagram.	**04**
	(c)	Explain sampling and quantization process to generate digital image. How many bits per pixel require representing 256 gray levels? What is memory required to store image of size 1024x768 with 256 gray levels?	**07**
Q.2	**(a)**	Is there any relationship between standard deviation of pixel intensities and contrast of image? Justify your answer.	**03**
	(b)	Express Affine Matrix for following geometric spatial transformations: [1] Rotation & [2] Translation	**04**
	(c)	Image is corrupted by sinusoidal interference. Explain digital image processing steps with help of Fourier transform for removal of sinusoidal interference.	**07**
		OR	
	(c)	Image is corrupted by salt and pepper noise. Explain suitable digital image processing technique to remove salt and pepper noise from the image.	**07**
Q.3	**(a)**	What is application of Power Law (Gamma) transformation in digital image processing?	**03**
	(b)	Write 3x3 mask for spatial low pass filtering which satisfy following mathematical expression: $R = \frac{1}{9}\sum_{i=1}^{9} z_i$ (Where Z_i is intensity level of i^{th} pixel) Write pseudo code to implement low pass filtering of given MxN image using this 3x3 mask.	**04**
	(c)	What is contrast stretching? Draw piece-wise linear input-output characteristics with corner points (0,0) (100,100) (150,200) (175,225) and (255,255). Determine the output for following input 4x4 image.	**07**

50	100	125	150
70	120	140	160
180	200	225	255
150	110	160	210

OR

Q.3	**(a)**	What type of analysis can be done by decomposing a digital image into its bit planes?	**03**
	(b)	What is necessity of image compression? Calculate amount of memory required to store HD Movie of 2 hour duration without compression (Resolution of HD: 1920x1080)	**04**
	(c)	What is importance of histogram in digital image processing? Explain process of calculating histogram of given digital image and algorithm of histogram equalization.	**07**
Q.4	**(a)**	Compare lossless and lossy digital image compression techniques	**03**
	(b)	What is structuring element? What is role of structuring element in morphological operations? Give any four examples of structuring elements.	**04**
	(c)	Explain use of second derivative for image sharpening. Express rotation invariant filter mask used to obtain second derivative of given digital image.	**07**

OR

Q.4	**(a)**	How run length encoding (RLE) works? Explain with help of example.	**03**
	(b)	Explain opening and closing morphological operations with example.	**04**
	(c)	How HSI Color model is well suited for human interpretation? Write expressions for conversion of HSI to RGB.	**07**
Q.5	**(a)**	Write Pseudo code to obtain negative image considering original gray-scale image of size MxN	**03**
	(b)	Explain contra-harmonic mean filter with help of mathematical expression.	**04**
	(c)	Explain Wiener filter for digital image processing. How it is different from inverse filtering and what are the drawbacks of Wiener filtering?	**07**

OR

Q.5	**(a)**	In automated assembly application, three classes of parts are to be color coded in order to simplify detection. However only monochrome television camera is available to acquire digital images. Propose a technique for using camera to detect three different colors.	**03**
	(b)	Explain multivariable thresholding used in image segmentation.	**04**
	(c)	Explain 2D discrete wavelet transform with help of block diagram. How 2D discrete wavelet transform is useful for digital image processing?	**07**

****