		Register Number:		……..
B.E DEGREE EXAMINATIONS: NOV/DEC 2012				
Seventh Semester				
ELECTRONICS AND COMMUNICATION ENGINEERING				
ECE144 Digital Image Processing				
Time: Three Hours				**Maximum Marks: 100**
Answer all the Questions:-				
PART A (10 x 1 = 10 Marks)				
1.	The elements responsible for photopic vision are :			
	a)	rods	b)	cones
	c)	rods and cones	d)	neurons
2.	The 8-connected elements of a pixel at location (x,y) are at a distance of :			
	a)	2	b)	1
	c)	4	d)	8
3.	The transformation that maps a narrow range of gray level values to a wider range is :			
	a)	log transformation	b)	image negation
	c)	power law transformation	d)	contrast stretching
4.	The ---------- operation enhances an image.			
	a)	$\nabla f(x,y)$	b)	$\nabla^2 f(x,y)$
	c)	$f(x,y) - f(x+1,y+1)$	d)	$f(x,y) - \nabla^2 f(x,y)$
5.	The pixel values at non-integer coordinates can be inferred from integer locations using :			
	a)	nearest neighbors	b)	highest pixel value
	c)	tiepoints	d)	gray level interpolation
6.	The parameters of noise in an image can be estimated from :			
	a)	histogram	b)	image sensors
	c)	Fourier transform	d)	All of the above
7.	The ---------- mask can detect discontinuities in the diagonal direction.			
	a)	Prewitt	b)	Sobel
	c)	Prewitt and Sobel	d)	Roberts
8.	A boundary descriptor that can be represented in one dimension is:			
	a)	signature	b)	skeleton
	c)	Statistical moments	d)	polygon
9.	The technique that can be applied in progressive compression is :			

	a)	Huffman coding	b)	Arithmetic coding	
	c)	RLE	d)	bit plane coding	
10.	In JPEG, the DC coefficients are encoded using :				
	a)	Huffman coding	b)	arithmetic coding	
	c)	bit plane coding	d)	DPCM	

PART B (10 x 2 = 20 Marks)

11.	How is an image acquired?
12.	What is connectivity of pixels?
13.	What happens to the image contrast after histogram equalization?
14.	Define gradient of an image.
15.	Distinguish between constrained unconstrained filtering in image restoration.
16.	Briefly describe any two types of noise in image with their PDF.
17.	What is an edge segment? How is it different from a boundary?
18.	Define texture of an image.
19.	Calculate the compression ratio if the size of an image is reduced by 25%.
20.	What is the block size used in JPEG? Justify the answer.

PART C (5 x 14 = 70 Marks)

21.	a)	(i)	Draw the cross-section of a human eye and explain how vision is perceived.	(10)
		(ii)	Obtain the Walsh-Hadamard transform matrix of size 8x8.	(4)
			(OR)	
	b)	(i)	Explain how the quality of an image is affected by varying the spatial and gray level resolution.	(6)
		(ii)	Obtain the Haar transform of the following image segment: $\begin{bmatrix} 24 & 25 & 66 & 88 \\ 22 & 20 & 21 & 22 \\ 13 & 13 & 29 & 2 \\ 80 & 9 & 9 & 2 \end{bmatrix}$	(8)

22.	a)	(i)	Explain the histogram equalization procedure.		(6)
		(ii)	Given pixel distribution as given below, illustrate how histogram equalization is used to enhance the image (Row 1 : pixel value, Row 2 : No. of pixels)		(8)

0	2	4	5	6	8	10	11	12	15
15	0	0	10	50	76	45	0	4	10

(OR)

	b)	(i)	Compute the gradient of the following image segment using Sobel mask and explain the result: $\begin{bmatrix} 4 & 2 & 1 & 18 \\ 99 & 22 & 21 & 22 \\ 36 & 3 & 38 & 36 \\ 84 & 68 & 57 & 12 \end{bmatrix}$	(7)
		(ii)	Explain frequency domain approach to image filtering.	(7)
23.	a)	(i)	With a block diagram, explain the image degradation – restoration process.	(7)
		(ii)	Explain how a Weiner filter is used in restoring an image.	(7)
			(OR)	
	b)	(i)	Explain any four noise models with mathematical expressions and necessary sketches.	(8)
		(ii)	Explain how geometric transformation is used in image restoration.	(6)
24.	a)	(i)	Explain how points, lines and edges can be detected using appropriate masks.	(10)
		(ii)	Explain any one region descriptor.	(4)
			(OR)	
	b)	(i)	Explain how thresholding is used in enhancing an image.	(6)
		(ii)	Explain how a boundary is represented using chain codes.	(8)
25.	a)	(i)	A source with three alphabets $\{a_1, a_2, a_3\}$ with probabilities {0.2, 0.7, 0.1} emits the sequence : $a_1a_2a_2a_2a_3a_1a_2a_1$ Find the real-valued tag for the sequence using arithmetic coding.	(10)
		(ii)	Compare Huffman and Arithmetic coding.	(4)
			(OR)	
	b)	(i)	Explain how wavelets are used in image compression. Illustrate.	(8)
		(ii)	Compare JPEG and JPEG2000.	(6)

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