Q.6		Attempt any two:					
	i.	What is image degradation and restoration model? Explain the Inverse filtering and Weiner filtering.	**5**	2	1, 2	5	
	ii.	Define following terms: (a) Coding redundancy (b) Inter pixel redundancy (c) Compression model	**5**	2	1	5	
	iii.	Define lossless and lossy compression with one example for each?	**5**	2	1, 4	5	

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering
End Sem Examination Dec 2024
RA3CO42 Digital Image Processing

Programme: B.Tech. Branch/Specialisation: RA

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	**BL**	**PO**	**CO**	**PSO**
Q.1	i.	Digitizing the coordinate values is called- (a) Radiance (b) Illuminance (c) Sampling (d) Quantization	**1**	1	1	1	
	ii.	No of bits to store image of dimensions MxN is denoted by the formula. (a) b = NxK (b) b = MxK (c) b = MxN (d) b = MxNxK	**1**	2	1, 2	1	
	iii.	Response of derivative mask is zero at- (a) Sharp intensities (b) Constant intensities (c) Low intensities (d) High intensities	**1**	2	1, 5	2	
	iv.	Fourier transform's domain is- (a) Frequency domain (b) Spatial domain (c) Fourier domain (d) Time domain	**1**	1	1	2	
	v.	Which image segmentation approach is based on detecting abrupt changes in image intensity? (a) Edge - based segmentation (b) Region - based segmentation (c) Texture - based segmentation (d) Contour - based segmentation	**1**	2	1, 4	3	

vi.	In Image segmentation, what does the term "Seed point" refer to? (a) Initial guess for the number of segments in an image. (b) Starting point for region growing algorithms. (c) Boundary point between two adjacent segments. (d) Mean Thresholding point.	**1**	2	1, 2	3		
vii.	Two regions are said to be adjacent if their union forms- (a) Connected set (b) Boundaries (c) Region (d) Edge	**1**	1	1, 4	4		
viii.	Which of the following describes a "feature" in an image? (a) The size of the image. (b) A distinctive pattern or detail in the image. (c) The color of the image. (d) The resolution of the image.	**1**	4	1, 5	4		
ix.	In wiener filtering, it is assumed that noise and image are _____. (a) Different (b) Homogenous (c) Correlated (d) Uncorrelated	**1**	2	1, 2	5		
x.	Encoder is used for- (a) Image enhancement (b) Image compression (c) Image decompression (d) Image equalization	**1**	1	1, 3	5		
Q.2	i. What is digital image processing? Write two best suited example of digital image processing.	**2**	1	1, 2	1		
	ii. What is Image? Explain following terms w.r.t. Image: (a) Illumination (b) Radiance	**3**	2	1	1		
	iii. What is pixel? Write down the basic relationship between pixels considering the principle of neighbourhood.	**5**	2	1, 2	1		

OR	iv. What is color model? Explain the types of color model based on representing digital image in different purposes.	**5**	1	1, 5	1		
Q.3	i. What is histogram equalization and contrast stretching?	**3**	2	1, 3	2		
	ii. What is smoothing and sharpening filter? Explain the types of low pass and high pass filters used in spatial domain.	**7**	3	1, 2	2		
OR	iii. What is 2D Fourier transform? Write the properties of 2D Fourier transform. How FFT can be constructed using DFT? Justify the answer with mathematical derived relation.	**7**	1	1, 2	2		
Q.4	i. What is morphological in image segmentation? Explain the morphological operation opening, closing, dilation, erosion.	**3**	2	1, 2	3		
	ii. What is Hough transform? How edge linking operation can be done using Hough transforms? Justify the answer with mathematical derivation.	**7**	2	1, 5	3		
OR	iii. What is Region based segmentation? Explain the following region-based segmentation technique: (a) Split and Merge (b) Region growing	**7**	2	1, 2	3		
Q.5	i. What is connected component labelling? Explain with an example.	**4**	1	1	4		
	ii. What is shape representation and description? Explain the contour based and region-based method for shape representation and description.	**6**	1	1	4		
OR	iii. Explain the steps for Scale-Invariant Feature Transform (SIFT) algorithm.	**6**	2	1, 2	4		

Marking Scheme

RA3CO42 Digital Image Processing

Q.1	i)	**(c) Sampling**	**1**
	ii)	**(d) b = MxNxK**	**1**
	iii)	**(b) Constant intensities**	**1**
	iv)	**(a) Frequency domain**	**1**
	v)	**(a) Edge - based segmentation**	**1**
	vi)	**(b) Starting point for region growing algorithms.**	**1**
	vii)	**(a) Connected set**	**1**
	viii)	**(b) A distinctive pattern or detail in the image.**	**1**
	ix)	**(d) uncorrelated**	**1**
	x)	**(b) Image compression**	**1**
Q.2	i.	What is digital image processing? Write two best suited example of digital image processing?	**2**
Answer:		Define digital image processing……1 mark Write two best suited example ……0.5 mark for each	
	ii.	What is Image? Explain following terms w.r.t. Image : i) Illumination ii) Radiance	**3**
Answer:		Define Image……1 Mark i) Define Illumination…….. 1 Mark ii) Define Radiance…….1 Mark	
	iii.	What is pixel? Write down the basic relationship between pixels (principle of neighbourhood)?	**5**
Answer:		Define pixel…….1 Mark Basic relationship between pixels (principle of neighbourhood)……4 Mark	
OR	iv.	What is color model? Explain the types of color model based on representing digital image in different purposes?	**5**
Answer:		Define color model…….1 Mark Types of color model ……4 Mark	
Q.3	i.	What is Histogram equalization and contrast stretching?	**3**
Answer:		Define Histogram equalization……1.5 Mark Contrast stretching……...1.5 Mark	
	ii.	What is smoothing and sharpening filter? Explain the types of low pass and high pass filters used in spatial domain?	**7**
Answer:		Define smoothing and sharpening filter……2 Mark Types of low pass filters used in spatial domain …2.5 Mark Types of high pass filters used in spatial domain….2.5 Mark	
OR	iii.	What is 2D Fourier transform? Write the Properties of 2D Fourier transform? How FFT can be constructed using DFT? Justify the answer with mathematical derived relation?	**7**
Answer:		Define 2D Fourier transform……..1 Mark Write the Properties of 2D Fourier transform…….3 Mark How FFT can be constructed using DFT? Justify the answer with mathematical derived relation…….3 Mark	
Q.4	i.	What is morphological in image segmentation? Explain the morphological operation opening, closing, dilation, erosion?	**3**
Answer:		Define morphological ……..……..1 Mark Morphological operation opening, closing, dilation, erosion……...0.5 Mark for each	
	ii.	What is hough transform? How edge linking operation can be done using hough transforms? Justify the answer with mathematical derivation?	**7**
Answer:		Define hough transform…….2 Mark How edge linking operation can be done using hough transforms…… answer with mathematical derivation……5 Mark	
OR	iii.	What is Region based segmentation? Explain the following region based segmentation technique: i) Split and Merge ii) Region growing	**7**
Answer:		Define Region based segmentation…….2 Mark i) Split and Merge……..2.5 Mark ii) Region growing…….2.5 Mark	
Q.5	i.	What is connected component labelling? Explain with an example?	**4**

Answer: Define connected component labelling……2 Mark
Explain with an example……..2 Mark

ii. What is shape representation and description? Explain the contour based and region-based method for shape representation and description? **6**

Answer: Define shape representation and description…….2 Mark
contour based method…….2 Mark
region based method……2 Mark

OR iii. Explain the steps for Scale-Invariant Feature Transform (SIFT) algorithm? **6**

Answer: Steps for Scale-Invariant Feature Transform (SIFT) algorithm……6 Marks (1Mark*6 step)

Q.6 Attempt any two:

i. What is Image degradation and restoration model? Explain the Inverse filtering and Weiner filtering? **5**

Answer: Define Image degradation and restoration model……1 Mark
Inverse filtering……..2 Mark
Weiner filtering……..2 Mark

ii. Define following terms: **5**
i) Coding redundancy
ii) Inter pixel Redundancy
iii) Compression model

Answer: Define following terms:
i) Coding redundancy…….1.5 Mark
ii) Inter pixel Redundancy……..1.5 Mark
iii) Compression model……2 Mark

iii. Define Lossless and Lossy compression with one example for each? **5**

Answer: Define Lossless with one example ……2.5 Mark
Define Lossy compression with one example……2.5 Mark

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