Scheme of Valuation/Answer Key

(Scheme of evaluation (marks in brackets) and answers of problems/key)

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: EC370

Course Name: Digital Image Processing

Max. Marks: 100 | Duration: 3 Hours

PART A

		Answer any two full questions, each carries 15 marks	Marks
1	a)	Diagram – 3 Marks Working – 3 Marks	(6)
	b)	2 Marks each – 2 x 3 = 6 Marks	(6)
	c)	3 properties – 1 Mark each - 3 Marks	(3)
2	a)	Recursive definition – 2 Marks. Application – 2 Marks $H_{2N} = \begin{bmatrix} H_N & H_N \\ H_N & -H_N \end{bmatrix} = H_2 \otimes H_N$	(4)
	b)	Circulant and Toeplitz Matrix – Structure 1 marks each – 2 Marks Example for each – 1x2 Marks = 2 Marks	(4)
	c)	$A_{mxn} = U_{mxm}\Sigma_{mxn}V^T_{nxn}$ - 2 Marks $AA^T = U\,\Sigma\Sigma^T\,U^T$ and $A^TA = V\,\Sigma^T\Sigma\,V^T$ U and V are the eigen vectors of AA^T and A^TA respectively. To get U find the Eigen value decomposition of AA^T. To get V find the Eigen value decomposition of A^TA. Square root of the diagonal entries in the diagonal matrix $\Sigma\Sigma^T$ or $\Sigma^T\Sigma$ Obtained in these Eigen value decomposition give the singular values which give the diagonal elements of Σ – 5 Marks	(7)
3	a)	Statement – 2 Marks Proof using convolution property of Fourier Transform – 4 Marks	(6)
	b)	Forward kernel – 2 Marks Reverse kernel – 1 Marks Separable – Justification – 2 Marks	(5)

	c)	$A=\begin{pmatrix}1/\sqrt{2} & 1/\sqrt{2}\\ 1/\sqrt{2} & -1/\sqrt{2}\end{pmatrix}$ $\mu_x=\begin{pmatrix}0\\0\end{pmatrix}$ - 2 Marks $y=A(x-\mu_x)=\begin{pmatrix}\sqrt{2}\\ \sqrt{2}\end{pmatrix}$ -2 Marks	(4)
		PART B	
		Answer any two full questions, each carries 15 marks	
4	a)	2 point processing operations – 1 Marks Graphs – 1 Mark each – 2 Marks Explanation – 1 Mark each – 2 Marks	(5)
	b)	Finding the histogram – 5 Marks Histogram equalization – 5 Marks 6 6 6 6 6 1 6 7 6 1 1 7 7 7 1 1 6 7 6 1 6 6 6 6 6	(10)
5	a)	Any 2 differences – 1.5x2 Marks = 3 Marks	(3)
	b)	Block diagram – 2 Marks, Explanation - 2 Marks	(4)
	c)	Limitations of Inverse filtering – 4 Marks Wiener filtering – Elimination of very small H(u,v) issue. Explanation with proper equations – 4 Marks	(8)
6	a)	H(u,v) equations and frequency response plots – 2x2 = 4 Marks Explanation of something effects with these filters – 1 Mark	(5)
	b)	Explanation – 2.5 Marks each – 2x2.5 = 5 Marks	(5)
	c)	Separation of illumination and reflectance components in homomorphic filtering - 5 Marks	(5)
		PART C	
		Answer any two full questions, each carries 20 marks	
7	a)	Region splitting and merging steps – 6 Marks	(6)
	b)	3x2 Marks = 6 Marks	(6)
	c)	Making to the parametric space – 2 Marks Steps for computing the line – 6 Marks	(8)
8	a)	Coding, inter pixel and psychovisual redundancy – 3+3+2 = 8 Marks	(8)

	b)	KLT is the optimal transform but data dependent. But obtaining basis images in KLT is non trivial. DCT has good information packing ability and kernel is fixed. 2x2 = 4 Marks	(4)
	c)	Arithmetic coding – 8 Marks	(8)
9	a)	Clustering algorithm – 8 Marks	(8)
	b)	Arrange the symbols in the decreasing order of their probabilities. – 2Marks Combine the lowest probability symbols into a single compound symbol that replaces them in the next source reduction – 3 Marks Work backwards along the table to assign the codes to the elements of the compound symbols. – 3 Marks **Symbol** **Probability** **Code** D 0.6 0 A 0.2 10 B 0.1 110 C 0.05 1110 E 0.05 1111	(8)
	c)	Any two edge detection masks 2x2 Marks = 4 Marks	(4)
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