Reg. No.



VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: APPLICATIONS OF DSP [ELE 4014]

REVISED CREDIT SYSTEM

Time	e: 3 Hours	Date: 2	25 November 2017	Max. Marks: 50	0						
Instr	uctions to Candidates:										
	 Answer ALL the questions 										
	 Missing data may be suitably assumed. 										
1A.	State and prove the differentiation in spatial domain property for 2D continuous space Fourier transforms.										
1B.	State and prove the continuous A is a (2 × 2) rotation matrix.	space Fo	ourier transform of the rotated image $f(A)$	π̄), where, (04))						
1C.	State and explain 1D sampling makes the signal's spectrum pe	g. Prove riodic".	or disprove the statement: "time domai	n sampling							
	Write relevant expressions for 2	2D samp	ling and its effect in the frequency domain	. (04))						
2A.	How do you remove (i) Gauss relevant (3×3) kernels.	ian and	(ii) impulse noise from an image? Expla	ain it using (03))						
2B.	Explain: (i) What would be the histogram of an image in generation of a structure in generation.	e effect o al?	of setting to zero the lower-order bit pla	ines on the							
	(ii) What would be the effect o instead?	n the his	stogram if we set to zero the higher-order	r bit planes							
	(iii) What would be the effect of	n the hist	togram if we normalize the image?	(03))						
2C.	Derive an expression for 2D-La constant variance Gaussian. Pro What are its advantages?	aplacian ove or di	of Gaussian (LoG) for a unit valued, zero isprove that the LoG is isotropic (rotation	mean and invariant). (04))						
3A.	Suppose that you form a spatia (x, y) but excludes the point its	l filter th elf.	nat averages the four immediate neighbor	s of a point							
	(i) Find the equivalent filter H(a	<i>u, v</i>) in th	he frequency domain.								
	(ii) Show that your result is a lo	wpass fil	lter.	(04))						
3B.	(i) Explain the image degradation	on/resto	ration model.								
	(ii) Write short notes on Gaussi	an and u	niform noise models.	(04))						
3C.	What is adaptive thresholding?	Explain	with neat flow chart/pseudo code.	(02))						
4A.	An (8×8) image $f[x, y]$ has gra	ay levels	given by the following equation:								
	f[x,y]	= x - y	; x, y = 0, 1, 2, 3, 4, 5, 6, 7.								

Find the output image obtained by applying a (3×3) mean filter on the image f[x, y]; note that the border pixels remain unchanged. (04)

4B. Write short notes on Butterworth high pass filter. Is it possible to construct a band pass filter using high pass and low pass filters? If yes, how? If no, why? **(0**

2	2	2	2	2	5	8	8	8	8
2	2	2	2	2	5	8	8	8	8
2	2	2	2	2	5	8	8	8	8
2	2	2	2	2	5	8	8	8	8
2	2	2	2	2	5	8	8	8	8
2	2	2	2	2	5	8	8	8	8

4C. Find the response of the 2D-Laplacian to the representative image given below:

Do not neglect the boundaries. Assume mirror boundary condition.

5A. Explain the following morphological operations:

(i) Opening (ii) Thinning

- **5B.** Perform the hit-or-miss operation using the structuring elements B₁ and B₂ in figure (5B1) on the image given in figure (5B2). (03)
- **5C.** Derive expressions for 1D-DCT using DFTs. Use the same to write expression for 2D-DCT. List the uses of DCTs. (03)



(02)

(04)

(04)