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RV COLLEGE OF ENGINEERING®

Autonomous Institution affiliated to VTU

V Semester B. E. Fast Track Examinations July -19

Computer Science and Engineering

FUNDAMENTALS OF COMPUTER VISION (ELECTIVE)

Time: 03 Hours

Maximum Marks: 100

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B.

PART-A

1	1.1	Aliasing in an image sampling leads to _____ pattern.	01
	1.2	Representing the image by insufficient number of gray levels, the resulting effect is known as _____.	01
	1.3	_____ is the first step in digital image processing.	01
	1.4	Define computer vision.	01
	1.5	What will be the effect of filtering in an image with the following mask?	
		$\frac{1}{368} \begin{bmatrix} 2 & 5 & 8 & 5 & 2 \\ 5 & 25 & 34 & 25 & 5 \\ 8 & 34 & 52 & 34 & 8 \\ 5 & 25 & 34 & 25 & 5 \\ 2 & 5 & 8 & 5 & 2 \end{bmatrix}$	02
	1.6	The Log (Laplacian of Gaussian) operator is mathematically represented as _____.	02
	1.7	In image segmentation, the direction of an edge at (x,y) is _____ to the direction of the gradient vector at that point.	01
	1.8	Define global thresholding in image segmentation.	02
	1.9	Image segmentation algorithm is based on _____ and _____ properties of intensity values.	01
	1.10	Differentiate between Agglomerative and divisive clustering.	02
	1.11	The probabilistic merging algorithm is based on _____ and _____.	02
	1.12	List different techniques used in padding.	02
	1.13	Identify the central issues in part based recognition.	02

PART-B

2	a	For the image segment shown below, compute the lengths of the shortest 4,8 and m paths between S and T for $V = \{5,6\}$ and $V = \{6,8\}$.	
		$\begin{matrix} & & & & & (T) \\ & & & & & \begin{bmatrix} 10 & 8 & 4 & 5 & 6 \\ 8 & 10 & 6 & 8 & 6 \\ 4 & 10 & 8 & 6 & 5 \\ 5 & 5 & 6 & 10 & 4 \\ (S) & 6 & 8 & 8 & 5 & 5 \end{bmatrix} \end{matrix}$	06
	b	Illustrate with a neat diagram Electromagnetic Spectrum and specify the range.	04
	c	Mention the basic relationships with reference to pixel neighbors.	06
OR			

3	a	Explain the effect of variation in spatial and gray level resolution on image with an example.	06
	b	Discuss image sampling and quantization with an example. Differentiate between uniform and non-uniform sampling and quantization.	04
	c	How is image processing linked with computer vision? Explain 3 types of computerized processing.	06
4	a	The image segment is shown in below matrix. Compute median filter to smooth the image using 3×3 mask for the marked pixels. $\begin{bmatrix} 18 & 35 & 63 & 157 & 15 & 32 \\ 176 & (148) & (182) & (17) & (65) & 46 \\ 54 & 10 & 46 & 72 & 10 & 20 \end{bmatrix}$	06
	b	List out any four properties of Fourier transforms and explain each of them. OR	10
5	a	Explain Bandpass and steerable filters.	08
	b	Explain smoothing and resampling algorithms.	08
6	a	Explain the following thresholding techniques with an example. i. Bi-level thresholding ii. Multilevel thresholding iii. Global thresholding	08
	b	Explain with algorithms, Otsu's method of segmentation. OR	08
7	a	Illustrate with relevant equations, the role of illumination and reflection in image thresholding.	10
	b	Write the algorithm for thresholding using heuristic approaches based on virtual inspection of the histogram.	06
8	a	Explain the approaches of i. Region splitting and merging ii. Region growing methods of image segmentation with an example.	08
	b	With necessary equations, explain mean shift filter. OR	08
9	a	Explain watershed and graph based segmentation with an example.	08
	b	With an example, explain parametric and non-parametric density function.	08
10	a	With a neat diagram, how part based graphical model can be used in category recognition.	08
	b	Explain neural networks for face detection with diagram. OR	08
11	a	With relevant equation, explain the boosting techniques for face detection.	08
	b	Explain the following: i. Object detection ii. Eigen faces	08