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Code No. : 16216

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD

B.E. (C.S.E. : CBCS) VI-Semester Main Examinations, January-2021

Image Processing

(Elective-I)

Time: 2 hours

Max. Marks: 60

Note: Answer any NINE questions from Part-A and any THREE from Part-B

Part-A (9 × 2 = 18 Marks)

Q. No.	Stem of the question	M	L	CO	PO																								
1.	Define Digital Image Processing and explain the basic concepts of sampling and quantization with neat sketch.	2	1	1	1																								
2.	When you enter a dark theater on bright day, it takes an appreciable interval of time before you can see well enough to find an empty seat. Which of the visual process play in this situation? .	2	2	1	1																								
3.	Define Low and High pass filter. How images are smoothed using frequency domain filters? .	2	2	2	1																								
4.	Show that Fourier transform of the unit impulse located at origin is 1.	2	3	2	2																								
5.	Show that how First derivative and second derivative useful for edge detection.	2	2	3	2																								
6.	Find the effect of Max , Min and average filter of size 3x3 on the given image	2	3	3	2																								
	<table border="1"> <tr><td>4</td><td>5</td><td>6</td><td>7</td><td>2</td><td>4</td></tr> <tr><td>3</td><td>2</td><td>1</td><td>7</td><td>2</td><td>4</td></tr> <tr><td>3</td><td>2</td><td>1</td><td>7</td><td>2</td><td>4</td></tr> <tr><td>4</td><td>5</td><td>6</td><td>7</td><td>1</td><td>2</td></tr> </table>	4	5	6	7	2	4	3	2	1	7	2	4	3	2	1	7	2	4	4	5	6	7	1	2				
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3	2	1	7	2	4																								
3	2	1	7	2	4																								
4	5	6	7	1	2																								
7.	Find the code for $G_4(9)$.	2	3	4	2																								
8.	Distinguish the loss and loss less image compression techniques.	2	2	4	1																								
9.	Draw the diagram for image Degradation/Restoration process.	2	2	5	1																								
10.	What are safe colors ? Can we have 334466 as safe color value ?	2	2	5	2																								
11.	Outline and label each part of Electromagnetic spectrum, list colors in visible range along with wavelengths.	2	2	1	1																								
12.	Compare Fourier transform and DFT, write DFT and inverse DFT expressions for two dimensional signal $f(x, y)$.	2	2	2	2																								

Part-B (3 × 14 = 42 Marks)

13. a) What are the components of image processing system and with the required diagram explain each component.

7 1 1 1

b) Consider the 2 image subsets S_1 and S_2 as shown below. For $v=\{1\}$ determine whether these 2 subsets are a) 4-adjacent b) 8-adjacent or c)m-adjacent

7 3 1 2

	S_1	S_2	
0	0 0 0 0 0	1 0 1 1 0	0
1	0 0 0 1 1	0 1 0 0 1	1
1	0 0 0 1 0	0 1 0 0 0	0
0	0 0 0 0 0	0 0 0 0 0	0
0	0 0 1 1 1	0 0 1 1 1	1

14. a) Explain one dimensional Fourier transform and its inverse, use relevant graphs, and describe changes in Fourier transform if number of points in discrete function doubles.

7 2 2 3

b) Illustrate any two sharpening frequency domain filters with relevant diagrams and expressions.

7 2 2 2

15. a) What is region based segmentation; explain region splitting and merging process for image segmentation.

7 1 3 2

b) Find the equalized histogram transformation for the given 8-bit hypothetical image of size 64x64.

7 3 3 2

r_k	n_k
r_0	790
r_1	1023
r_2	850
r_3	656
r_4	329
r_5	245
r_6	122
r_7	81

16. a) Explain image compression model with diagrams.

7 2 4 1

b) Apply Huffman coding method for developing variable length codes for symbols a ,b, c, d, e and f .

7 3 4 3

Symbol	a	b	C	d	e	f
Probability	0.45	0.13	0.12	0.16	0.09	0.05

17. a)	Distinguish the various noise models with mean and variance of noise functions, and draw the PDF of different noise functions.	7	2	5	2
b)	Compare Pseudo color image processing and full color image processing.	7	2	5	2
18. a)	Illustrate how Linear sensors, Array Sensors and Linear sensor strips useful for image acquisition.	7	2	1	1
b)	Show that Fourier transform of the impulse train $S_{\Delta T}$ is $\frac{1}{\Delta T} \left(\sum_{n=-\infty}^{\infty} F \left(\mu - \frac{n}{\Delta T} \right) \right)$	7	3	2	3
19.	Answer any <i>two</i> of the following:				
a)	Suppose that an image has the intensity PDF $P_r(r) = 2r/(L-1)^2$ for $0 \leq r \leq (L-1)$ and $P_r(r) = 0$ for all other values. Find the transformation function that will produce an image whose intensity PDF is $P_z(z) = 3z^2/(L-1)^3$ for $0 \leq r \leq (L-1)$ and $P_z(z) = 0$ for other values of z .	7	3	3	2
b)	Find the arithmetic code for the message $a_1 a_2 a_3 a_3 a_4$.	7	3	4	2
c)	Explain the need for HIS and RGB color model and how color value is converted from HIS specification to RGB specification and Vice Versa.	7	2	5	2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	60
2	Knowledge on application and analysis (Level-3 & 4)	40
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	-
