



PAPER ID-410561

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Subject Code: KCS062

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BTECH
(SEM VI) THEORY EXAMINATION 2023-24
IMAGE PROCESSING

TIME: 3 HRS**M.MARKS: 100**

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A**1. Attempt all questions in brief.****2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Define components of image processing system.	02	1
b.	What is meant by illumination and reflectance.	02	1
c.	What is meant by binary image, color image, gray-scale image	02	2
d.	What is the need of Image Enhancement.	02	2
e.	What is contrast stretching.	02	3
f.	What are the types of Noise.	02	3
g.	What do you understand by Convex Hull.	02	4
h.	Define morphological image processing.	02	4
i.	In which situation we use region merging and region splitting.	02	5
j.	What are first order derivative filters.	02	5

SECTION B**2. Attempt any three of the following:****3 x 10 = 30**

a.	What do you understand by Digital image processing. Explain the different stages of digital image processing?	10	1																		
b.	Explain the term histogram. How can histogram stretching of an image can be done. Compute histogram stretching of a given image. <table><tr><td>Gray level</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>Number of Pixel</td><td>0</td><td>0</td><td>20</td><td>20</td><td>5</td><td>19</td><td>0</td><td>0</td></tr></table>	Gray level	0	1	2	3	4	5	6	7	Number of Pixel	0	0	20	20	5	19	0	0	10	2
Gray level	0	1	2	3	4	5	6	7													
Number of Pixel	0	0	20	20	5	19	0	0													
c.	Given below is a 4 x 4 image. What will be the new value of the pixel (2, 3) if following filters are applied. <table><tr><td>5</td><td>2</td><td>1</td><td>7</td></tr><tr><td>4</td><td>6</td><td>2</td><td>3</td></tr><tr><td>5</td><td>4</td><td>4</td><td>1</td></tr><tr><td>3</td><td>1</td><td>2</td><td>5</td></tr></table> a) Arithmetic mean Filter c) Harmonic mean filter b) Geometric mean filter d) Max and Min filter	5	2	1	7	4	6	2	3	5	4	4	1	3	1	2	5	10	3		
5	2	1	7																		
4	6	2	3																		
5	4	4	1																		
3	1	2	5																		
d.	What do you understand by hit-miss transform and why they are used explain in brief?	10	4																		
e.	Explain the following morphological operations: i. Opening ii. Closing iii. Region filling	10	5																		



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TIME: 3 HRS**M.MARKS: 100****SECTION C**

3. Attempt any one part of the following: **1 x 10 = 10**

a.	Briefly explain the elements of visual perception. Explain how image is formed.	10	1
b.	Write short notes on a) Sampling and Quantization b) Brightness adaption and discrimination.	10	1

4. Attempt any one part of the following: **1 x 10 = 10**

a.	Derive the frequency domain transformation function $H(u, v)$ for the following spatial domain filter $h(x, y)$. How Homomorphic filtering is implemented. <table border="1"><tr><td>0</td><td>-1</td><td>0</td></tr><tr><td>-1</td><td>8</td><td>-1</td></tr><tr><td>0</td><td>-1</td><td>0</td></tr></table>	0	-1	0	-1	8	-1	0	-1	0	10	2
0	-1	0										
-1	8	-1										
0	-1	0										
b.	Discuss order statistics filters with suitable example.	10	2									

5. Attempt any one part of the following: **1 x 10 = 10**

a.	What is image restoration. Draw and explain the basic block diagram of restoration process.	10	3																
b.	What are the linear and non-linear smoothing filters in spatial domain. Compute the new pixel values after applying the 3 x 3 box filter on the following 4 x 4 matrix of a 3-bit image. <table border="1"> <tr><td>3</td><td>7</td><td>0</td><td>7</td></tr> <tr><td>4</td><td>4</td><td>1</td><td>5</td></tr> <tr><td>3</td><td>2</td><td>2</td><td>3</td></tr> <tr><td>5</td><td>0</td><td>6</td><td>4</td></tr> </table>	3	7	0	7	4	4	1	5	3	2	2	3	5	0	6	4	10	3
3	7	0	7																
4	4	1	5																
3	2	2	3																
5	0	6	4																

6. Attempt any one part of the following: **1 x 10 = 10**

a.	Explain thinning operation. Thin the following image. Show the image after each step. <table><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr></table>	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0	1	1	1	0	0	1	1	1	0	0	10	4
1	1	0	0	0	0	0	1	1	1																																												
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1	1	1	1	1	1	1	1	0	0																																												
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1	1	1	0	0	1	1	1	0	0																																												
b.	Explain the Region-based Segmentation. Explain the types of region-based segmentation in Image Processing.	10	4																																																		

7. Attempt any one part of the following: **1 x 10 = 10**

a.	Discuss about the principle of lossless compression algorithms with suitable examples.	10	5
b.	Write a short note on following: a) Edge detection algorithm b) Line detection algorithm	10	5