

Pattern Recognition And Image Processing

Notes For Final Exam

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Final
Exam

Pattern Recognition
And
Image Processing
Segment-5

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1] Define Morphological processing? And its application?

Ans: Morphological processing deals with tools for extracting image components that are useful in the representation and description of shape.

Application:

- i) For extracting image component
- ii) For bridging gaps.
- iii) For removing image component.
- iv) To construct filters.

2] Why pruning algorithm is necessary in many image processing application?

Ans: The pruning algorithm is a technique used in digital image processing based on mathematical morphology. It is used as a complement to the skeleton and thinning algorithm to remove unwanted parasitic components. In this case, parasitic components refer to branches of a line which are not key to the overall shape of the line and should be removed.

3 Describe lossless (Error free) and lossy compression
OR Differentiate between them.

Ans: Lossless and lossy compression are terms that describe whether or not, in the compression of a file, all original data can be recovered when the file is uncompressed.

Lossless compression

With lossless compression, every single bit of data that was originally in the file remains after the file is uncompressed. All of the information completely restored.

It is used for text document files or spreadsheet files where losing words could pose a problem.

- GIF image also used lossless compression.

Lossy compression

Lossy compression reduces a file by permanently eliminating certain information, especially redundant information. When the file is uncompressed, only a part of the original information is still there.

It is used for video and sound, where a certain amount of information loss will not be detected by most users. JPEG used also lossy compression.

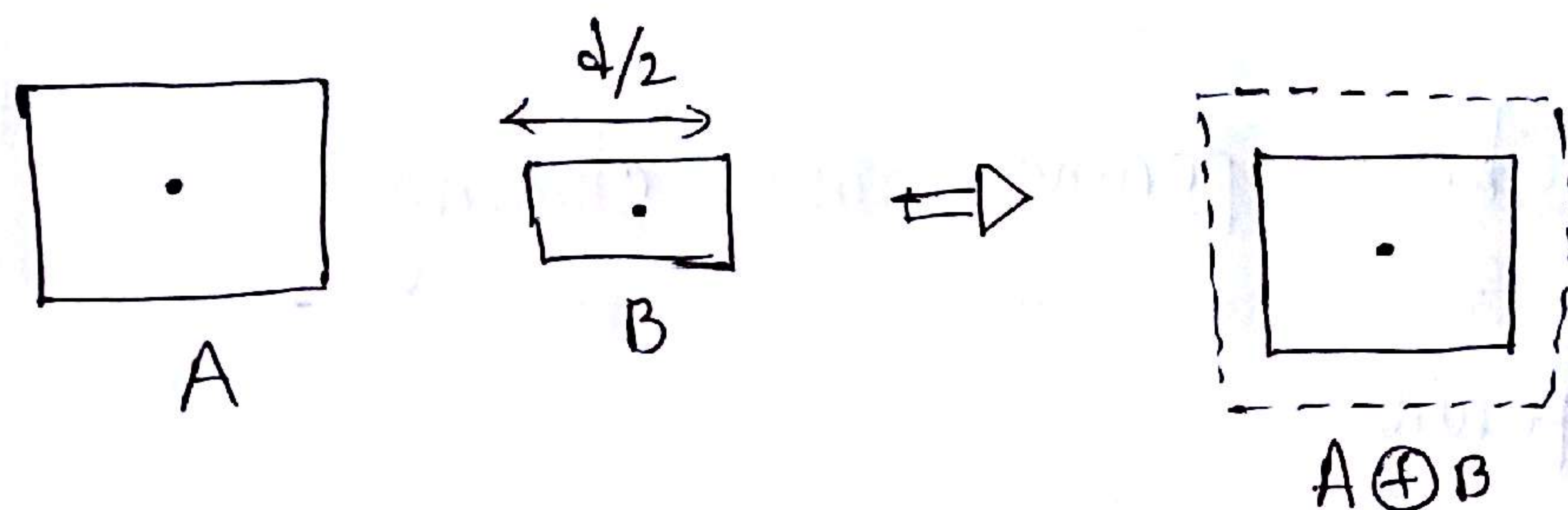
4 Describe dilation and Erosion with example.

Ans: Dilation

Dilation grow the thickness of an object.

With A and B as set in \mathbb{Z}^2 , the dilation of object A by structural element B , is defined as -

$$A \oplus B = \{z \mid (\hat{B})_z \cap A \neq \emptyset\}$$

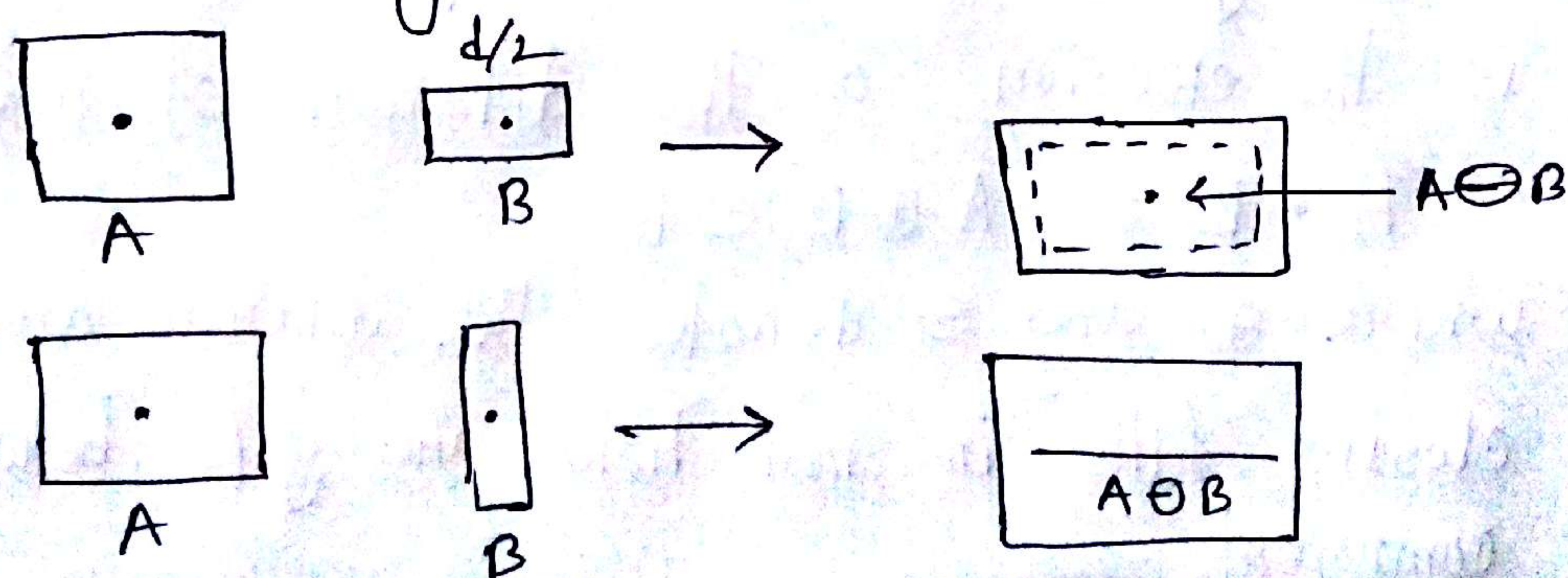


Erosion:

For sets A and B in \mathbb{Z}^2 the erosion of B , denoted by $A \ominus B$ is defined as -

$$A \ominus B = \{z \mid (B)_z \subseteq A\}$$

This equation indicates that the erosion of A by B is the set of all points z such that B , translated by z , is contained in A .



5 what is the duality property?

Ans: Erosion and dilation are duals of each other with respect to set complementation and reflection. that is -

$$(A \ominus B)^c = A^c \oplus \hat{B}$$

$$(A \oplus B)^c = A^c \ominus \hat{B}$$

6 Describe opening and closing

Ans: - opening

Opening is the dilation of the erosion of a set A by a structuring element B.

$$A \circ B = (A \ominus B) \oplus B$$

where \ominus and \oplus denote erosion and dilation.

opening removes small connected component in binary image.

closing:

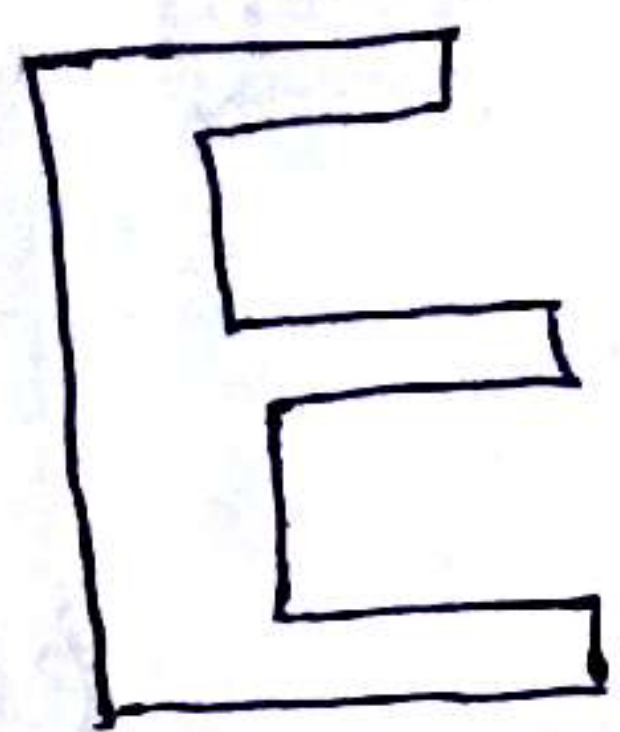
The closing of a set A by a structuring element B is the erosion of the dilation of that set.

$$A \bullet B = (A \oplus B) \ominus B$$

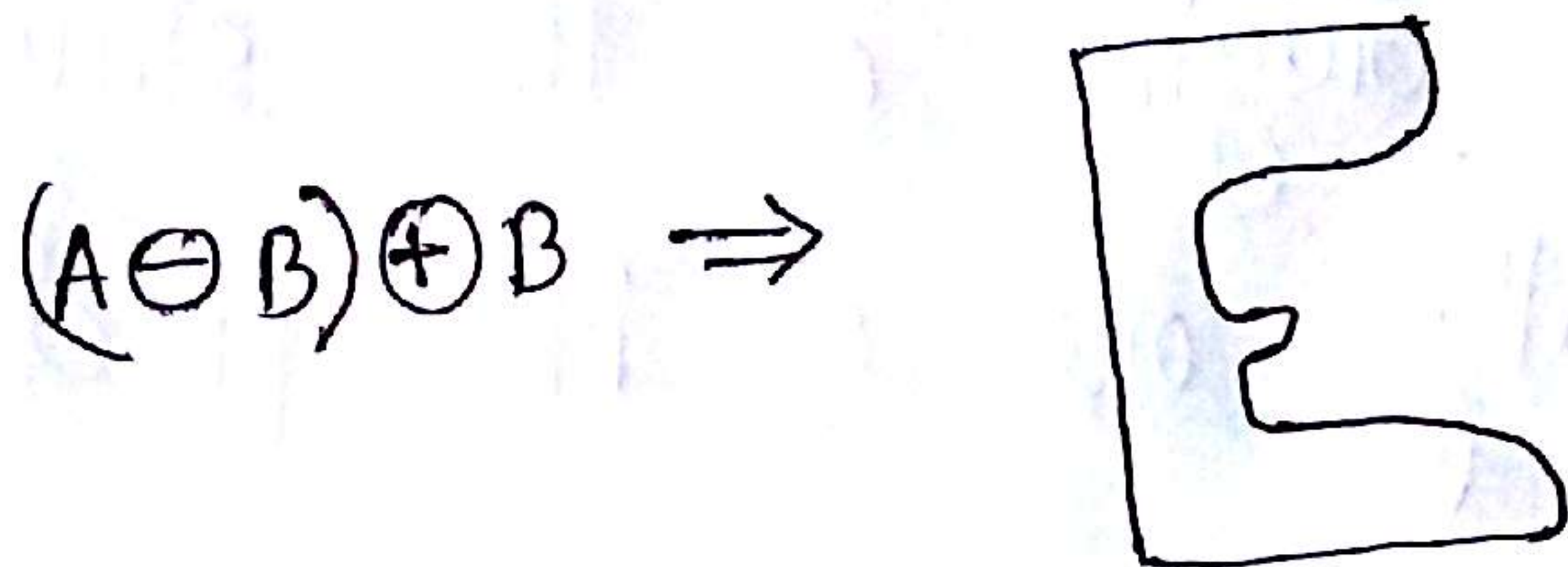
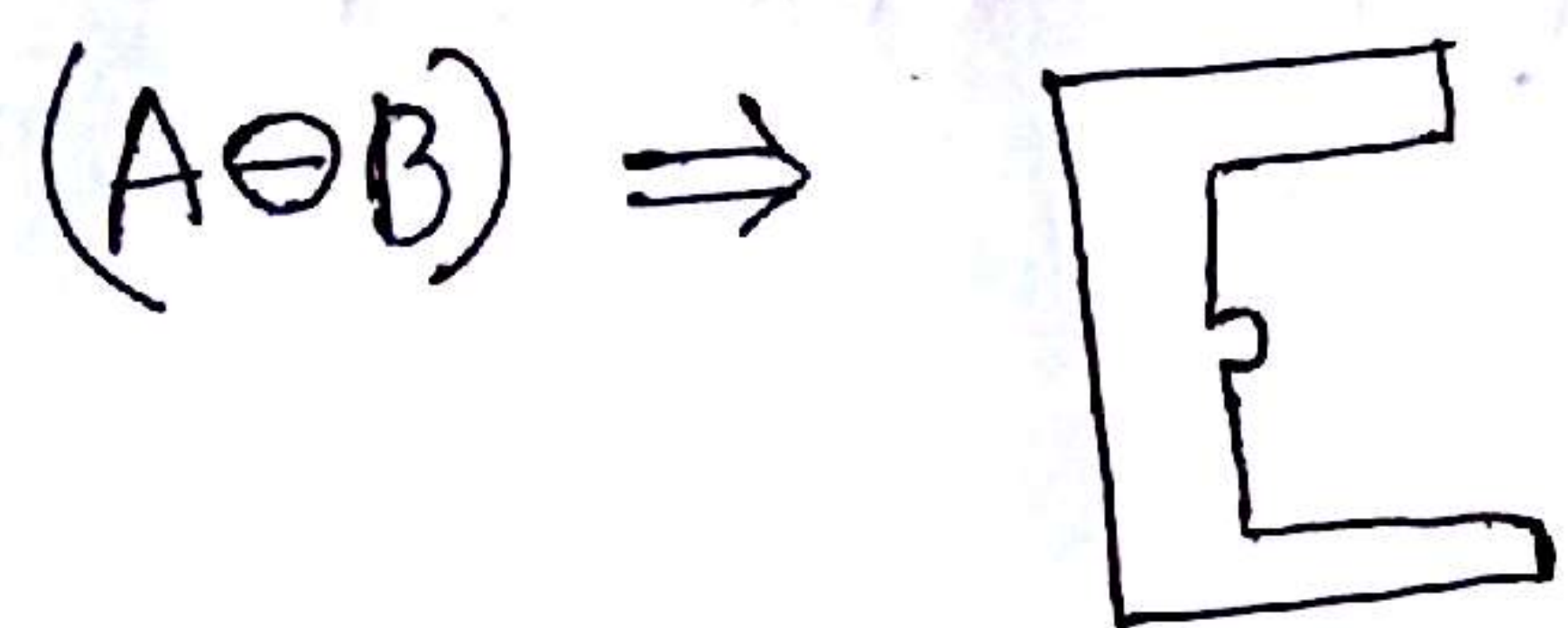
where \oplus and \ominus denotes the dilation and erosion.

closing fills in small holes and gaps between connected component.

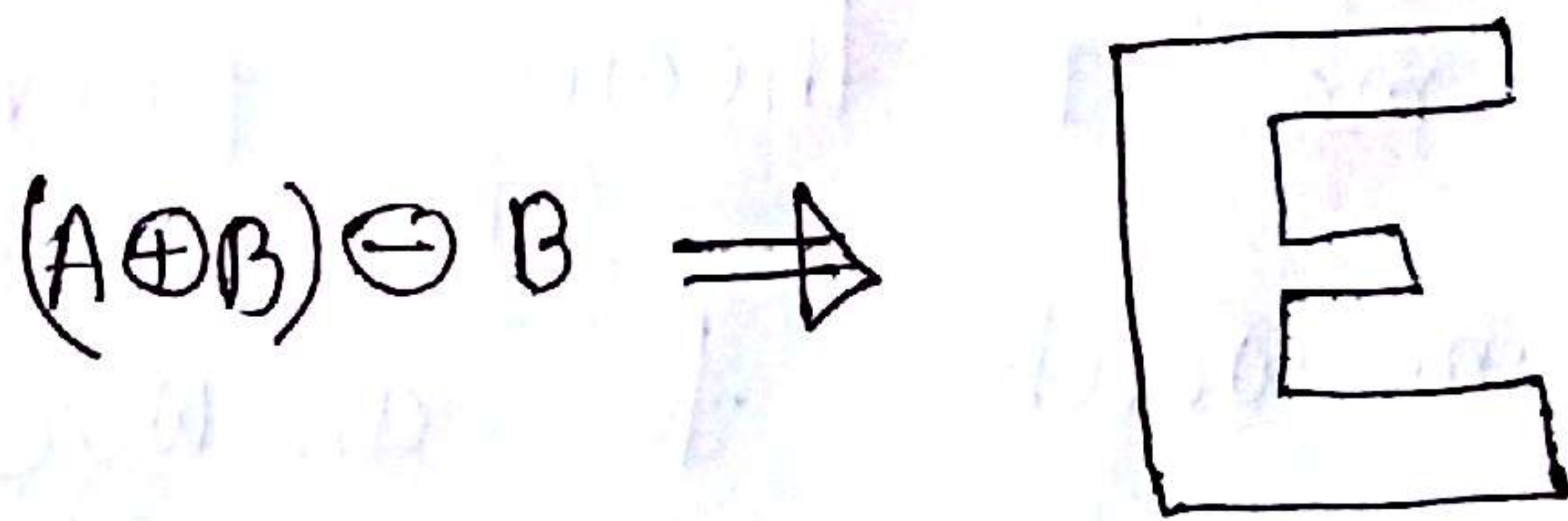
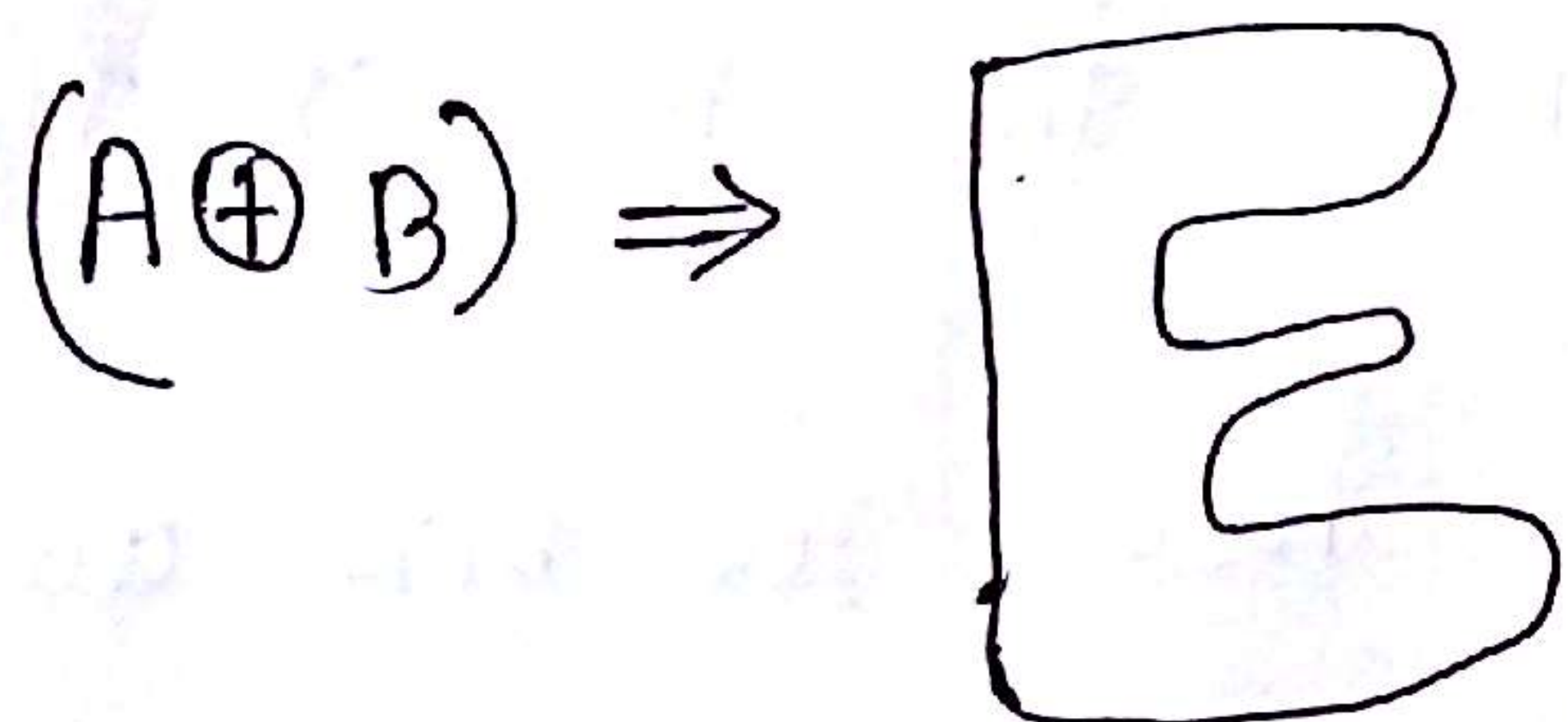
Example :



opening $(A \circ B) = (A \ominus B) \oplus B$



Closing : $A \bullet B = (A \oplus B) \ominus B$



Q] what are the effects of structuring element in morphological processing?

Ans: The structuring element is a small binary image, a small matrix of pixels, each with a value of zero or one

0	1	0
1		1
0	1	0

- (1) The matrix dimension specify the size of the structuring element.
- (2) The pattern of ones and zeros specifies the shape of the structuring element.
- (3) An origin of the structuring element is usually one of its pixel.

8 What is information Theory?

Am: Information theory provides the mathematical framework to answer how few bits are actually needed to represent the information in an image. Its fundamental premise is that the generation of information can be modeled as a probabilistic process.

$$I(E) = \log \frac{1}{P(E)} = -\log P(E)$$