

Assignment

Instructions:

✓ Question No. 1–4:

- Must be completed in handwritten format.
- Include all mathematical calculations and detailed steps.

📌 Submission Requirements:

You must submit:

1. PDF copy of the handwritten assignment. File name format:
RollNumber_Batch_Name.pdf

 **Deadline: 10 June 2026**

Late submissions will not be accepted.

1. Boundary Extraction

Given the binary image A:

```
0 0 0 0 0 0 0 0
0 1 1 1 1 1 0 0
0 1 1 0 0 1 1 0
0 1 0 0 0 1 0 0
0 1 1 1 1 1 0 0
0 1 0 0 0 1 0 0
0 1 1 1 1 1 0 0
0 0 0 0 0 0 0 0
```

Using a 3×3 structuring element of all 1's:

- Compute erosion $A \ominus B$
- Extract the internal boundary using:
 $\beta(A) = A - (A \ominus B)$
- Find the external boundary using:
 $\beta_e(A) = (A \oplus B) - A$
- Compare internal and external boundaries.

2. Hole Filling

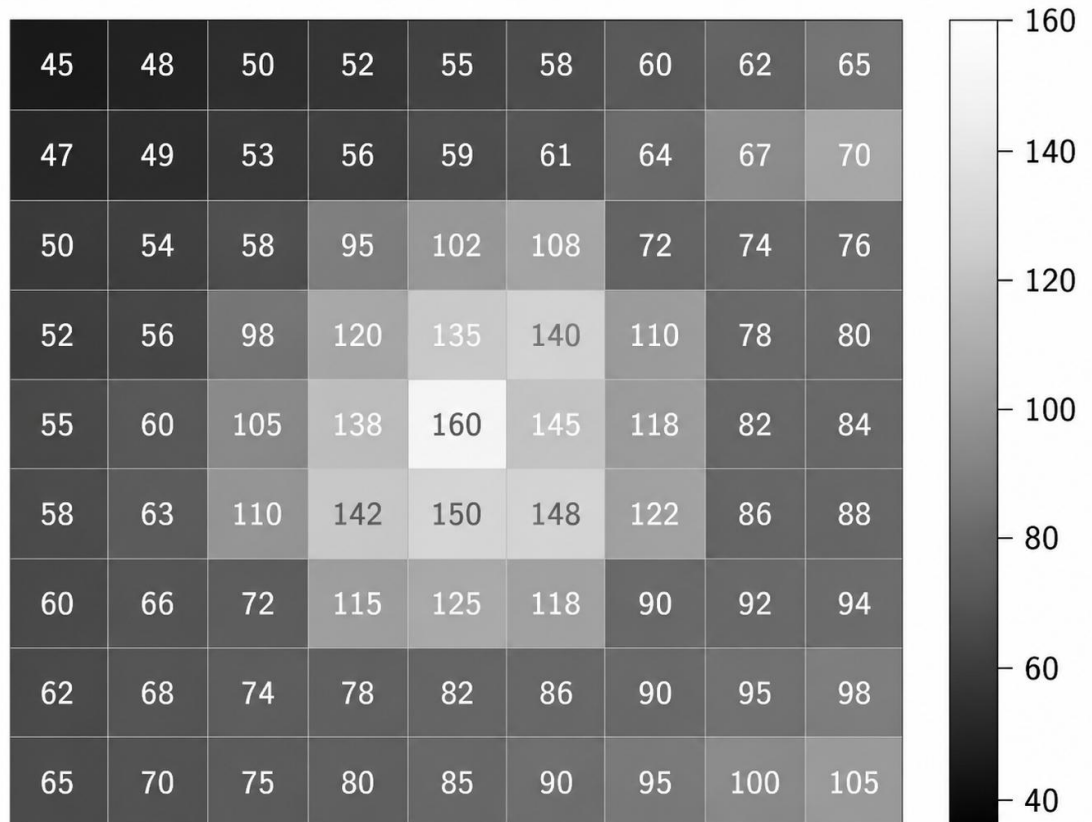
Given the image:

```
0 0 0 0 0 0 0 0 0
0 1 1 1 1 1 1 1 0
0 1 0 0 1 0 0 1 0
0 1 0 1 1 1 0 1 0
0 1 0 0 0 1 0 1 0
0 1 1 1 0 1 1 1 0
0 1 0 0 0 0 0 1 0
0 1 1 1 1 1 1 1 0
0 0 0 0 0 0 0 0 0
```

Perform hole filling using morphological operation and show the calculation step by step.

3. Global Thresholding

Given the grayscale image:



Perform global thresholding to find the threshold value T. Draw the binary image after Segmentation.

4. Otsu Thresholding

Given the histogram:

Gray Level : 0 1 2 3 4 5 6 7

Frequency : 12 18 25 40 38 20 10 5

Using Otsu's method, determine optimal threshold T