

Here's a breakdown of the actual question-wordings that recur across the four most recent mid-term papers (Autumn '23, Spring '23, Autumn '22, Spring '22), grouped by how many times they appear:

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## **Appears in all 4 papers**

### **1. Fields of Image Processing**

“<...> – Explain the fields of image processing used in the statement.”

- A23 Q1(a): “‘Nowadays image processing based autonomous vehicle and quadcopter are widely used’ – Explain the fields of image processing used in the statement.”
- S23 Q1(a): “‘One picture is worth more than ten thousand words’ – Explain the fields of image processing used in the statement.”
- A22 Q1(a): “‘Image processing is developed for improvement of pictorial information for human interpretation’ – explain.”
- S22 Q1(a): “‘One picture is worth more than ten thousand words’ – Explain the fields of image processing used in the statement.”

### **2. Analog vs. Digital-Image Model**

“Write/explain the mathematical model of analog and digital image”

- A23 Q1(c): “‘A digital image is a representation of a two-dimensional image as a finite set of digital values’ – do you agree with the statement? Explain the answer with mathematical formula.”
- S23 Q1(c): “Explain the mathematical model of an analog image. How can we convert an analog image to digital image?”
- A22 Q2(a): “Write the mathematical model of analog and digital image.”

- S22 Q1(d): “A digital image is a representation of a two-dimensional image as a finite set of digital values’ – do you agree with the statement? Explain the answer with mathematical formula.”

### 3. Median-Filter vs. Averaging (Low-pass) for De-noising

“<...> – justify/explain why median filtering is better than averaging (or low-pass) filtering.”

- A23 Q3(a): “Median filter technique is the best way to de-noise the image’ – Justify the statement with your own word with proper example.”
- S23 Q2(c) ii: “Performance of Median filtering is better than Averaging filtering’ – Explain.”
- A22 Q3(b): “The performance of Median filtering is better than low pass filtering for removing noise’ – Why? Calculate median filtering of the following image. (Use padding.)”
- S22 Q3(b): “The performance of Median filtering is better than low pass filtering for removing noise’ – Why? Calculate median filtering of the following image. (Use padding.)”

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## Appears in 3 of 4 papers

### 1. Histogram Equalization / Specification

“Apply histogram equalization to the image..., sketch the histograms..., and explain why equalization may not produce a perfectly flat histogram (or whether histogram specification is better).”

- A23 Q2(b) i–ii (+ iii on specification)
- S23 Q2(b) i–ii (+ iii on non-flat result)
- S22 Q3(a): “When automatic enhancement is desired, equalization is a good approach. Explain with example in which approach histogram specification

performs better. Justify your answer with the image provided in 2(b)."

## 2. **Low-pass + High-pass = Original Image**

"Analyze the statement 'Lowpass + Highpass = Original image'."

- A23 Q3(c) alt ii
- S23 Q3(c) alt ii
- S22 Q3(c) alt ii

## 3. **Eyes vs. Camera**

"Write the similarity and difference between eyes and camera."

- A23 Q1(d) alt
- S23 Q1(d) alt
- A22 Q1(c)

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## **Appears in 2 of 4 papers**

### 1. **Color Perception & RGB→CMY/HIS**

"Explain how human beings perceive color. Given a color image in RGB, derive the corresponding CMY and HIS coordinates."

- A23 Q3(b)
- S23 Q3(b)

### 2. **Prewitt vs. Sobel Edge Operators**

“Perform the Prewitt and Sobel operators on the image (use padding) and analyze the differences.”

- S23 Q3(c)i
- S22 Q3(c)i

### 3. Convolution/Correlation Usage

“If we convolve and correlate an image with the matrix below, what would be the relation between the original and modified image?”

- A23 Q2(c) alt
- S22 Q1(b): “Why convolution/mask operation and correlation is used in image processing? Explain with proper example.”

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## Unique to a single paper

- **Autumn 2023 only**

- Piecewise-linear contrast stretch (clip 0–49 to 0, 50–150 enhance, 151–255 to 255) (Q1b)
- Add-constant brightness & image-averaging question (Q2c)
- Laplacian operator on a 4×4 image (Q3c i)

- **Spring 2023 only**

- Calculate the resolution of a 20" monitor at 1024×768 (Q1b)
- ISRO Chandrayaan-3 image-processing applications (Q1d)
- Spatial- vs. frequency-domain enhancement (Q2a)

- **Autumn 2022 only**

- 4-adjacency vs. 8-adjacency connectivity (Q1b)
- Baud-rate transmission or file-size calculation (Q1d)
- Spatial-resolution and intensity-levels effects (Q2b)
- Bit-plane slicing of a 4-bit image (Q3a)
- Threshold types in spatial filtering (Q3c)

- **Spring 2022 only**

- Gray-level slicing & monotonic transform justification (Q2a)
- High-color (12-bit) vs. true-color (24-bit) justification (Q2b)
- Otsu's threshold on a 5×5 image (Q2b alt)

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**Take-home:** you **must** master the three “4-of-4” questions (fields of IP, analog/digital model, median vs. averaging), and then focus on the “3-of-4” topics (histogram equalization/specification, filter decomposition, eye vs. camera) to cover nearly everything you’ll see on future mid-terms.