QPC: R251M015 AR 24 Reg. No

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET UNIVERSITY)

Ph.D. (First Semester-Summer) Examinations, December – 2025

23SPPEEC1011 – Digital Image and Video Processing

(ECE)

Time: 3 hrs Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer *ANY FIVE* Questions. **(14 x 5 = 70 Marks)** **Marks**

1.a.	Define quantization in the context of digital image formation. Explain how the number of quantization levels (bit depth) affects the visual quality and storage requirements of a digital image.	8
b.	Compare and contrast progressive and interlaced scanning techniques in video systems. What are the advantages of progressive scanning for modern digital media?	6
2.	Explain the concept of spatial filtering for image enhancement. Differentiate between linear and non-linear spatial filters, providing one practical example and application for each type.	14
3.a.	Discuss the role of morphological operations (e.g., erosion, dilation) in image segmentation. How can they be used for tasks like boundary extraction or removing small artifacts?	7
b.	Explain region-growing segmentation. What are the key steps involved, and what challenges arise in choosing the initial seed points and similarity criteria?	7
4.	Describe the process of converting a color image from the RGB color model to the HSV/HSI color model. Why is the HSV/HSI model often more intuitive and useful for tasks like color-based object tracking or image editing compared to RGB?	14
5.a.	Describe the concept of chain codes as a boundary descriptor. How do Freeman chain codes work, and what is their main advantage and disadvantage in representing a shape's contour?	7
b.	Explain what texture descriptors are in the context of regional description. Name and briefly describe two statistical methods used for texture analysis.	7
6.a.	Explain the concept of image compression. Distinguish between lossless and lossy compression, giving a common example and use case for each.	7
b.	Explain the principle of block-based motion estimation (e.g., using macroblocks) in video compression. How does it contribute to reducing temporal redundancy in a video sequence?	7
7.	Describe clustering-based segmentation techniques, such as K-means clustering. How can they be applied to both grayscale and color image segmentation? Provide an example of a practical application.	14
8.a.	Discuss the challenges of color constancy in digital image processing. Why does the same object appear to have different colors under different lighting conditions, and why is this a problem for computer vision?	7
b.	Explain the basic architecture and working principle of a simple convolutional neural network (CNN) for image classification. How does it fundamentally differ from a traditional classifier like the Bayes classifier?	7

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