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B.Tech DEGREE EXAMINATION, JUNE 2024

Fifth Semester

18AIE332T - IMAGE AND VIDEO PROCESSING

(For the candidates admitted during the academic year 2018-2019 to 2021-2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks) — Answer **all** Questions

		Marks	BL	CO
1.	Which component of an image processing system captures images from various sources? (A) Image Analysis Algorithms (B) Preprocessing Components (C) Image Acquisition Devices (D) User Interface	1	1	1
2.	What is the process of recovering images that have been degraded by noise or distortions called? (A) Image Compression (B) Image Segmentation (C) Image Restoration (D) Image Recognition	1	2	1
3.	A digital image is represented in 24-bit color depth. How many different colors can be represented in this image? (A) 8 colors (B) 24 colors (C) 256 colors (D) Over 16 million colors	1	2	1
4.	A digital image processing system aims to analyze the frequency components of an image. Which transform(s) can be used to analyze both the amplitude and phase information of the image's frequency domain representation? (A) DFT and FFT (B) FFT and DCT (C) DFT and DCT (D) DFT, FFT, and DCT	1	2	1
5.	The compression technique aims to reduce redundancy in the coding of an image? (A) LosslessCompression (B) LossyCompression (C) IrrelevantInformationCompression (D) Spatial Redundancy Compression	1	2	2
6.	The commonly used for lossy compression of photographic images? (A) JPEG (B) PNG (C) GIF (D) TIFF	1	2	2
7.	In all the filtering and smoothening techniques ,frequency domain technique involves selectively attenuating specific frequencies in an image? (A) Selective Filtering (B) Image Smoothing (C) Image Sharpening (D) Homomorphic Filtering	1	2	2
8.	spatial filter is used for reducing noise in an image either it might be filters or processing, If processing the values will not be 100 %, if not Filters, choose the best? (A) Smoothing LinearFilters (B) Sharpening SpatialFilters (C) Combined Spatial Enhancement Methods (D) Local Histogram Processing	1	2	3
9.	To restore the image and reduce the impact of noise, which common spatial domain method would you employ? (A) Inverse Filtering – Wiener (B) Singular Value Decomposition (C) Adaptive Filters (D) Band Pass Filters	1	2	3

10. Which video signal standard is commonly used in Europe and other regions? 1 2 3
(A) NTSC (B) PAL
(C) SECAM (D) RGB

11. What is the aspect ratio of the standard high-definition television (HDTV) resolution of 1920x1080 pixels? 1 2 3
(A) 4:3 (B) 16:9
(C) 1:1 (D) 21:9

12. When an object moves closer to an observer, which of the following statements about its photometric effects is true? 1 2 3
(A) It appears brighter (B) It appears dimmer
(C) Its color changes (D) It remains constant

13. Motion parallax is more pronounced when an object is: 1 2 4
(A) Stationary (B) Moving slowly
(C) Moving quickly (D) Rotating

14. Which of the following is the correct formula for the 2D Fourier Transform of a function f(x, y)? 1 1 4
(A) $F(u, v) = \iint f(x, y) * e^{(-j2\pi(ux + vy))} dxdy$ (B) $F(u, v) = \iint f(x, y) * e^{(j2\pi(ux + vy))} dxdy$
(C) $F(u, v) = \iint f(x, y) * e^{(-j\pi(ux + vy))} dxdy$ (D) $F(u, v) = \iint f(x, y) * e^{(j\pi(ux + vy))} dxdy$

15. Which property of the 2D Fourier Transform states that scaling a function in the spatial domain leads to scaling in the frequency domain? 1 2 4
(A) Convolution theorem (B) Shift theorem
(C) Modulation theorem (D) Scaling theorem

16. What is the occlusion problem in computer vision? 1 1 4
(A) A problem related to image compression (B) Difficulty in recognizing objects when they are partially hidden by other objects
(C) A challenge in image registration (D) An issue with color correction in images

17. What is a depth map used for in the context of occlusion handling? 1 1 4
(A) To add texture to occluded objects (B) To estimate the distance of objects in a scene
(C) To increase the resolution of occluded regions (D) To remove occluded objects from images

18. Which machine learning technique is commonly used for object detection and recognition in the presence of occlusion? 1 1 4
(A) Support Vector Machines (SVM) (B) Principal Component Analysis (PCA)
(C) Convolutional Neural Networks (CNN) (D) K-Means Clustering

19. How is the step size (learning rate) typically determined in the Steepest Descent method? 1 2 5
(A) It is set to a fixed value for all iterations (B) It is randomly generated at each iteration
(C) It is calculated using line search methods (D) It is equal to the gradient magnitude

20. Which waveform-based coding technique is commonly used for audio compression in formats like MP3? 1 2 5
(A) Pulse Code Modulation (PCM) (B) Wavelet Transform c
(C) Discrete Cosine Transform (DCT) (D) Vector Quantization (VQ)

PART - B (5 × 4 = 20 Marks)

Answer **any 5** Questions

		Marks	BL	CO
21.	An image processing engineer is working on a project to digitize old photographs. Write the basic concepts of sampling and quantization, and how they are applied in converting continuous image data into digital form for storage and processing	4	3	2
22.	Prove how image is transferred in step by step process to attain an digital form , from the Knowledge base.	4	2	2
23.	You are a photo restoration specialist tasked with reviving an old, faded photograph that holds sentimental value to a client. The image lacks contrast, making details hard to discern. How would you employ spatial domain methods to enhance the contrast and revive the old photograph?	4	4	3
24.	Compare Huffman coding with other data compression techniques, such as Run-Length Encoding (RLE) and Arithmetic Coding. Highlight the key differences in their approaches and efficiency in terms of compression ratios	4	3	3
25.	Describe briefly about fundamentals of Image Compression	4	2	3
26.	Write about the standard of Digital Video signal and Digital Video Processing	4	3	4
27.	Enumerate the steepest Descent method with steps.	4	2	4

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	CO
28.	(a) Describe briefly about the structure of the Human Eye with neat sketch	12	3	1
	(OR)			
	(b) You are tasked with enhancing an old photograph that has faded over time. The image contains important historical information, but it's barely discernible due to degradation. Explain how you would apply local histogram processing and adaptive filters to improve the image quality. Provide a step-by-step process, including the rationale behind your choices.			
29.	(a) In image compression, what are the key differences between lossless and lossy compression techniques, and under what circumstances would you choose one over the other, Explain it.	12	4	2
	(OR)			
	(b) You have an image with varying lighting conditions across different regions. Explain how local histogram processing can be used to enhance the contrast and details in this image. Describe the steps involved in implementing local histogram equalization. Provide an example illustrating its effectiveness and potential challenges			
30.	(a) How does the efficiency of Huffman coding change when applied to different types of data, such as text, images, or binary files? Are there specific considerations for adapting Huffman coding to different data types?	12	4	3
	(OR)			
	(b) Prove that spatial frequency domain techniques is useful for the image region splitting and merging with an example.			
31.	(a) Define the Sampling structures of Analog Video and explain it in detail.	12	3	4
	(OR)			
	(b) Relate the photometric Image formation and photometric effects of 3D Motion and explain it.			
32.	(a) Enumerate the 2D Motion Estimation with optical flow and 2D Motion vs apparent Motion with correspondence optical flow	12	3	5
	(OR)			
	(b) Describe in detail about (i) Region based Motion Estimation (ii) Mesh based Motion Estimation			

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