SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CYBER SECURITY

QUESTION BANK

V SEMESTER - III YEAR

CY3561– BIOMETRIC SECURITY

Regulation – 2023

Academic Year: 2025 – 2026 (ODD)

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SRM Nagar, Kattankulathur-603203

DEPARTMENT OF CYBER SECURITY

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SUBJECT : CY3561– BIOMETRIC SECURITY
SEM / YEAR : V SEMESTER/ III YEAR

UNIT -I INTRODUCTION

Introduction and Definitions of bio–metrics, Traditional authenticated methods and technologies. Introduction to Image Processing, Image Enhancement Techniques: Spatial Domain Methods: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters, Smoothing and sharpening filters.

UNIT –I [PART-A]

Q.No	Question	Competence	Level
1	Define biometrics.	Remembering	BTL1
2	Describe the traditional authenticated methods of biometrics.	Remembering	BTL1
3	Describe the process of biometrics.	Remembering	BTL1
4	Give the real time applications of biometrics.	Evaluating	BTL2
5	What is the purpose of image enhancement in biometrics?	Applying	BTL2
6	Explain the term image processing.	Remembering	BTL1
7	How do biometrics work?	Analysing	BTL1
8	What are the different types of biometrics?	Understanding	BTL2
9	What are security and privacy issues of biometrics?	Understanding	BTL2
10	Is biometrics secure or not?	Understanding	BTL2
11	Define image processing.	Creating	BTL2
12	List the spatial domain methods.	Remembering	BTL1
13	Define smoothing filters.	Understanding	BTL2
14	What is a sharpening filter?	Remembering	BTL1
15	List the image enhancement techniques.	Applying	BTL2
16	Give the applications of image processing techniques.	Applying	BTL1
17	How do you enhance the images?	Analysing	BTL1
18	How to enhance the images of biometrics?	Evaluating	BTL2
19	List the fundamental steps in Digital Image Processing.	Analysing	BTL2
20	What is image restoration?	Creating	BTL1
21	Explain Laplacian filter.	Understanding	BTL2
22	Evaluate the functions of sharpening filters.	Evaluating	BTL1
23	What are the main types of frequency domain filters used in biometric security?	Applying	BTL2
24	How do sharpening filters enhance the clarity and sharpness of biometric images ?	Analysing	BTL1

UNIT –I [PART-B]

Q.No		Question	Marks	Competence	Level
1	-	Explain in detail about the significance in identification and authentication systems. Discuss the advantages and limitations of biometrics compared to traditional authentication methods.	16	Remembering	BTL3

2		Discuss about the fundamental steps in Digital Image Processing.	16	Evaluating	BTL4
3	**-**	Describe in detail about biometrics and its real time applications but illustrating its pros and cons.	16	Understanding	BTL3
4	**-**	Summarize the role of feature extraction in biometric systems and also discuss the challenges associated with image quality in biometrics?	16	Understanding	BTL3
5	**-**	Explain in detail about image enhancement techniques in biometrics? How do these techniques improve the quality and reliability of biometric images?	16	Applying	BTL3
6		Explain about the components of an image processing system with its necessary diagram.	16	Analysing	BTL4
7	**A**	Explain the concept of biometric recognition.	08	Remembering	BTL3
	B	Discuss the role of image processing in biometric systems.	08		
8	**-**	Explain about the fundamental steps in Digital Image Processing.	16	Analysing	BTL4
9	**-**	Explain about the components of an image processing system.	16	Remembering	BTL3
10	**A**	Compare the various biometric modalities.	08	Remembering	BTL3
	B	Discuss the various biometric modalities applications.	08		
11	**-**	How do smoothing filters contribute to enhancing biometric images for improved recognition accuracy in biometric security systems?	16	Understanding	BTL3
12	**-**	How frequency domain do filters aid in noise reduction or artifact removal in biometric images?	16	Applying	BTL3
13	**-**	Explain the process of converting biometric images from the spatial domain to the frequency domain for applying frequency domain filters	16	Applying	BTL3
14	**-**	Determine the potential risks or drawbacks associated with the application of sharpening filters in biometric security, such as the possibility of amplifying noise or artifacts?	16	Creating	BTL4
15	**-**	What specific image characteristics or features can be enhanced using Laplacian filters in biometric recognition systems?	16	Understanding	BTL4
16	**-**	Analyze the effectiveness and suitability of smoothing and sharpening filters in biometric security.	16	Analysing	BTL4
17	**-**	How does the choice of Laplacian filter parameters, such as the filter size or threshold value, impact the performance of biometric security systems?	16	Evaluating	BTL3

UNIT -II IMAGE ANALYSIS

Image Restoration & Reconstruction: Model of Image Degradation/restoration process, Noise models, spatial filtering, inverse filtering, Minimum mean square Error filtering.

UNIT-II [PART-A]

Q.No	Question	Competence	Level
1	Define image restoration.	Remembering	BTL1
2	Give the formula for Spatial domain and frequency domain.	Remembering	BTL1
3	What are the common causes of image degradation?	Understanding	BTL2
4	How can you enhance the sharpness and clarity of a blur image?	Creating	BTL2
5	What is image restoration and why is it important?	Remembering	BTL1
6	How does noise affect image quality and how can it be reduced?	Understanding	BTL2

7	Define the term Image Degradation.	Remembering	BTL1
8	Differentiate between image degradation and restoration process.	Understanding	BTL2
9	Are there any software tools or algorithms specifically designed for image restoration?	Understanding	BTL2
10	What techniques are available for removing scratches, dust, and other physical damage from scanned images?	Analysing	BTL1
11	Define the term Image restoration.	Applying	BTL2
12	What are the two foundation equations for most of the restoration material?	Analysing	BTL1
13	Draw the model of the image degradation/ restoration process.	Creating	BTL1
14	List the most common noise PDFs found in image processing applications.	Applying	BTL2
15	Summarize Exponential Noise.	Applying	BTL2
16	What is uniform noise?	Evaluating	BTL1
17	Define periodic noise.	Analysing	BTL2
18	What is Harmonic Mean Filter?	Evaluating	BTL2
19	Define Salt-and-Pepper Noise.	Analysing	BTL1
20	What is white noise?	Remembering	BTL1
21	Define Arithmetic Mean filter.	Understanding	BTL2
22	How can the minimum filter be applied in biometric security to enhance the quality of biometric images?	Applying	BTL1
23	Give the functions of Spatial Filtering.	Remembering	BTL1
24	Evaluate the minimum mean square error filtering.	Evaluating	BTL2

UNIT -II [PART-B]

Q.No		**Question**	**Marks**	**Competence**	**Level**
1		Compare and contrast the advantages and limitations of image restoration techniques in the spatial and frequency domains. Provide examples of restoration methods in each domain and discuss their respective applications.	16	Evaluating	BTL4
2	**-**	Illustrate the model of image degradation and image restoration process.	16	Analysing	BTL4
3	**A**	Explain the concept of image degradation and restoration.	08	Understanding	BTL4
	B	Discuss the major factors that can lead to image degradation and the importance of image restoration techniques.	08		
4	**-**	Explain the image degradation process with its application.	16	Understanding	BTL3
5	**-**	Compare and contrast the advantages and limitations of spatial domain and frequency domain image restoration techniques. Provide examples of situations where each approach is most effective.	16	Applying	BTL3
6	**-**	Discuss about the various Noise models with the necessary diagrams.	16	Applying	BTL3
7	**-**	Discuss briefly the noise-reduction capabilities of the spatial filters and several other filters.	16	Understanding	BTL3
8	**A**	Explain the model of the image degradation/restoration process in detail.	08	Creating	BTL4
	B	Write its applications and its limitations in the technology field.	08		

9	**-**	Discuss about Optimum Notch Filtering.	16	Applying	BTL3
10	**-**	Derive the Fourier-Slice theorem.	16	Analysing	BTL4
11	**A**	What are the quantitative metrics commonly used to evaluate the performance of spatial filtering techniques in biometric security?	08	Evaluating	BTL3
	B	How does spatial filtering contribute to the robustness and reliability of biometric systems?	08		
12	**-**	Briefly explain the restoration in the presence of noise only spatial filtering	16	Remembering	BTL3
13	**-**	What are the specific challenges or limitations of applying inverse filtering to biometric data, such as fingerprint or iris images?	16	Remembering	BTL3
14	**A**	How does inverse filtering help in recovering or compensating for image degradations or blurring effects in biometric images?	08	Evaluating	BTL4
	B	What are the common evaluation metrics used to assess the performance of inverse filtering techniques?	08		
15	**-**	What is the principle behind minimum mean square error (Wiener) filtering	16	Understanding	BTL3
16	**-**	What are the key advantages of using Wiener filtering over other spatial filtering techniques in biometric security applications	16	Remembering	BTL4
17	**-**	What are the potential risks or drawbacks of applying inverse filtering in biometric systems, such as the possibility of amplifying noise or artifacts?	16	Analysing	BTL4

UNIT –III IMAGE EXTRACTION

Introduction to image segmentation: Image edge detection: Introduction to edge detection, types of edge detectors. Introduction to image feature extraction.

UNIT-III [PART-A]

Q.No	Question	Competence	Level
1	What is image segmentation, and how does it differ from image extraction or object recognition?	Remembering	BTL1
2	List out the common techniques and algorithms used for image segmentation?	Remembering	BTL1
3	What are the main goals and applications of image segmentation in computer vision?	Analysing	BTL2
4	How does image segmentation impact the efficiency of image compression and storage?	Remembering	BTL1
5	How do thresholding and clustering methods contribute to image segmentation?	Understanding	BTL2
6	Define image edge detection, and why is it important in computer vision and image processing?	Analysing	BTL2
7	How does edge detection differ from other image processing techniques, such as image filtering or segmentation?	Understanding	BTL2
8	What are the main methods or algorithms used for image edge detection?	Understanding	BTL2
9	How is the Laplacian of Gaussian (LoG) operator applied for edge detection in images?	Applying	BTL2
10	What are the applications of image edge detection in real-world scenarios, such as object recognition or tracking?	Evaluating	BTL1
11	What is edge detection in the context of digital image processing?	Applying	BTL1

12	Difference between Canny edge detection algorithm and other edge detection techniques.	Remembering	BTL1
13	What are the main types of edge detectors used in digital image processing?	Understanding	BTL2
14	Difference between gradient-based and Laplacian-based edge Detectors	Creating	BTL1
15	What is the Canny edge detector, and why is it considered one of the most effective edge detectors?	Creating	BTL2
16	How does the Canny edge detector address the issue of false positives and false negatives?	Applying	BTL2
17	How is the Laplacian of Gaussian (LoG) operator applied for edge detection, and what are its characteristics?	Remembering	BTL1
18	What is image feature extraction, and why is it important in computer vision and image processing?	Understanding	BTL2
19	How are image features used for pattern recognition, object detection, and image classification tasks?	Evaluating	BTL1
20	List outs the challenges and limitations associated with image feature extraction.	Remembering	BTL1
21	What role does image preprocessing play in image feature extraction, and what are some common techniques used?	Applying	BTL1
22	Can you explain how image feature extraction is used in image stitching and panorama creation?	Evaluating	BTL1
23	What is the impact of image resolution and noise on the accuracy of image feature extraction?	Analysing	BTL2
24	Difference between local and global features in image feature extraction.	Analysing	BTL2

UNIT -III [PART-B]

Q.No		**Question**	**Marks**	**Competence**	**Level**
1	**-**	Explain in detail about the fundamental purpose of image feature extraction, and how does it enable effective image analysis and understanding?	16	Remembering	BTL3
2	**-**	Describe the various types of information can be captured through image features, and how do they aid in recognizing patterns and objects?	16	Analysing	BTL4
3	**-**	What are the primary goals of image feature extraction in different computer vision applications, such as object recognition, image classification, and image retrieval?	16	Understanding	BTL3
4	**-**	Describe the challenges and limitations associated with image feature extraction, particularly in complex and cluttered scenes?	16	Evaluating	BTL5
5	**-**	How do image feature extraction techniques contribute to content-based image retrieval (CBIR) systems and similarity-based image search?	16	Understanding	BTL4
6	**-**	How does the Canny edge detector address the issues of noise sensitivity and multiple responses to a single edge?	16	Remembering	BTL3
7	**A**	What are the main types of edge detectors used in digital image processing, and how do they differ in their underlying principles?	08	Applying	BTL3
	B	How is the Laplacian of Gaussian (LoG) operator applied for edge detection, and what are its characteristics and limitations?	08		

8	**-**	Explain the concept of the Marr-Hildreth edge detection method and its steps for detecting edges based on zero-crossings?	16	Understanding	BTL4
9	**-**	How do multi-modal image segmentation methods integrate information from different imaging sources?	16	Remembering	BTL3
10	**-**	Discuss the role of clustering algorithms, such as K-means and Mean-Shift, in unsupervised image segmentation?	16	Evaluating	BTL4
11	**-**	Discuss the importance of pre-processing steps, such as image smoothing and filtering, in image segmentation?	16	Creating	BTL4
12	**-**	What is image edge detection, and why is it a fundamental step in image processing and computer vision tasks?	16	Remembering	BTL3
13	**-**	How do edges represent boundaries and transitions between different regions in an image?	16	Understanding	BTL3
14	**-**	What are the main goals and applications of image edge detection in various domains, such as object detection, image segmentation, and feature extraction?	16	Creating	BTL4
15	**-**	Explain the various key characteristics of good edge detectors, and how are they evaluated?	16	Applying	BTL3
16	**A**	Write short note on Gradient-based method.	05	Analysing	BTL4
	B	Laplacian-based method.	05		
	C	Canny edge detection method.	06		
17	**-**	What role does edge detection play in computer vision tasks, such as contour detection, object recognition, and Image stitching?	16	Applying	BTL3

UNIT –IV TECHNOLOGIES IN BIO–METRIC

Bio–metric technologies: Fingerprint, Face, Iris, Hand Geometry, Gait recognition, Ear, Voice, Palm print, On–Line Signature Verification, 3D Face Recognition, Dental Identification and DNA.

UNIT -IV [PART-A]

Q.No	Question	Competence	Level
1	Define biometric.	Remembering	BTL1
2	What is meant by voice recognition?	Remembering	BTL1
3	What is fingerprint synthesis?	Understanding	BTL2
4	List four sensing technique in fingerprint.	Remembering	BTL1
5	Define hand geometry.	Analysing	BTL2
6	Explain about face recognition	Applying	BTL2
7	What is meant by gait recognition?	Remembering	BTL1
8	Explain about biometric with example.	Analysing	BTL2
9	Give the advantages of voice recognition	Understanding	BTL2
10	Define iris recognisation	Analysing	BTL2
11	List the disadvantage of voice recognition	Remembering	BTL1
12	How does palmprint work? What are the disadvantages present in it?	Understanding	BTL2
13	Mention two unique features of palmprint.	Creating	BTL1
14	What are the steps involved in modified orientation field estimation algorithm to handle the creases in palmprints ?	Creating	BTL1
15	What framework does the low resolution palmprint recognition systems adopt while processing?	Evaluating	BTL1
16	What is meant by voice recognition?	Applying	BTL2
17	What is online signature verification?	Applying	BTL2

18	What are the key challenges in online signature verification?	Remembering	BTL1
19	How does online signature verification work?	Understanding	BTL2
20	What are the advantages and disadvantages of online signature verification?	Analysing	BTL2
21	What are the main advantages of 3D face recognition compared to other biometric modalities?	Applying	BTL2
22	What are the potential applications of 3D face recognition technology?	Evaluating	BTL1
23	What are some of the challenges faced in implementing 3D face recognition systems?	Understanding	BTL2
24	What is dental identification and how is it used in forensic investigations?	Evaluating	BTL1

UNIT -IV [PART-B]

Q.No		**Question**	**Marks**	**Competence**	**Level**
1	A	Discuss the four sensing technique in fingerprint in detail.	08	Understanding	BTL3
	B	Write short note on fingerprint synthesis.	08		
2	-	What is meant by heterogeneous face recognition	16	Remembering	BTL3
3	-	Illustrate about design of an iris recognisation system.	16	Remembering	BTL3
4	-	Explain about image capture and feature extraction in hand geometry	16	Applying	BTL3
5	-	Mention the iris recognisation design system with a neat diagram.	16	Analysing	BTL4
6	-	Explain about Ear detection in detail with neat diagram.	16	Understanding	BTL3
7	A	Explain about voice recognition in detail with neat diagram.	08	Evaluating	BTL4
	B	What is meant by image capture in hand geometry	08		
8	-	Describe about sensing technique in fingerprint in detail.	16	Remembering	BTL3
9	-	What is dental identification, and how does it contribute to forensic investigations involving human remains?	16	Applying	BTL3
10	-	Discuss the limitations and ethical considerations associated with dental identification and DNA analysis in forensic investigations. What precautions should be taken to ensure the proper use of these methods?	16	Creating	BTL4
11	-	What is a palm print and how is it used in biometric identification?	16	Remembering	BTL3
12	-	Summarize the main challenges associated with palm print recognition technology.	16	Applying	BTL3
13	-	Explain the concept of palm print recognition and its applications in biometrics. How does palm print recognition differ from other biometric modalities?	16	Creating	BTL3
14	-	Explain the process of online signature verification and discuss its applications in the digital world.	16	Analysing	BTL4
15	-	Explain online signature verification, and how does it work?	16	Analysing	BTL4
16	-	List out the various advantages and challenges of online signature verification.	16	Understanding	BTL3
17	-	Explain in detail about voice recognition.	16	Remembering	BTL4

UNIT -V BIO–METRIC SYSTEMS

Multi bio–metrics Introduction –Sources of Multiple Evidence, Acquisition and Processing Architecture– Fusion levels–sensor–level, feature–level, score–level, rank–level, decision– level fusion; Security of biometric systems– introduction, Adversary attacks, attacks at the user interface, attacks on biometric processing, attacks on the template Database– Case study of 3D face recognition and DNA matching.

[PART-A]

Q.No	Question	Competence	Level
1	Write about Multi Bio-Metrics System.	Remembering	BTL1
2	Differentiate multibiometric systems and Unibiometric systems.	Remembering	BTL1
3	What are the advantages of multi bio-metrics system?	Analysing	BTL2
4	List out the sources of multiple Evidence.	Understanding	BTL2
5	What is the Acquisition Sequence?	Understanding	BTL2
6	Describe Fusion Levels in multi biometric systems.	Creating	BTL1
7	What are the categories of Biometric Fusion? Also list out the subcategories.	Remembering	BTL1
8	What is Mosaicing?	Applying	BTL2
9	Write the equation of Template Update scheme in a Homogeneous feature fusion.	Understanding	BTL2
10	Explain about fusion at confidence level.	Remembering	BTL1
11	What is Hybrid Multi-biometric System?	Understanding	BTL2
12	What are the design issues to be addressed in a multi biometric System?	Evaluating	BTL2
13	Why do we prefer Heterogeneous feature fusion over Feature Level Fusion?	Analysing	BTL1
14	What is a Security Threat?	Remembering	BTL1
15	List out the classes of Security Threats.	Applying	BTL1
16	What are the attack mechanisms of Biometrics	Applying	BTL2
17	Write down the types of adversary attacks in a biometric System.	Creating	BTL2
18	List out the various attacks at the User Interface level.	Analysing	BTL2
19	What is Spoof Detection?	Evaluating	BTL2
20	Write about Hill-climbing attacks.	Evaluating	BTL1
21	List down the techniques for securing passwords.	Understanding	BTL1
22	What are the categories of Transform schemes in the Transformation Function?	Remembering	BTL1
23	What are Biometric Cryptosystems?	Analysing	BTL1
24	Define the term helper data.	Applying	BTL2

UNIT -V [PART-B]

Q.No		Question	Marks	Competence	Level
1	-	Summarize the case study of Deep Learning-Based Face Recognition Models for Sibling Identification	16	Remembering	BTL3
2	-	Describe briefly about acquistion and processing Architecture in detail.	16	Analysing	BTL4
3	-	Explain about Processing Sequence and Illustrate an example.	16	Understanding	BTL3
4	-	Describe about Multiple Evidences in Multi biometric Systems.	16	Understanding	BTL4

5	**-**	Write about Fusion Levels in Multi biometric Systems.	16	Understanding	BTL3
6	**A**	Write short note on Score – Level Fusion.	08	Applying	BTL3
	B	Write briefly about the two approaches of Score – Level fusion.	08		
7	**-**	Differentiate between Homogeneous and Hetergeneous Fusion Levels.	16	Remembering	BTL3
8	**A**	What are Security Threats and their Classes?	08	Evaluating	BTL4
	B	Illustrate and explain about each of the classes of security threats.	08		
9	**-**	Explain in detail about Adversary Attacks and their categories.	16	Remembering	BTL3
10	**-**	Explain the various attacks at the User Interface.	16	Analysing	BTL4
11	**-**	Write short notes on Spoof Detection and their Physiological Properties.	16	Understanding	BTL3
12	**-**	Explain in detail about the Attacks on the System Modules.	16	Analysing	BTL4
13	**-**	Describe about the attacks at the Interconnections.	16	Evaluating	BTL3
14	**A**	What are the Challenges and requirements in biometric template security?	08	Understanding	BTL3
	B	Elaborate Standard Encryption Approach.	08		
15	**-**	What are the various techniques for securing passwords?	16	Creating	BTL3
16	**-**	Explain about the attacks on Template Database.	16	Applying	BTL3
17	**-**	Describe in detail about the feature Transformation Approaches.	16	Understanding	BTL4