Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. Biomedical Engineering (Full Time) - END SEMESTER EXAMINATIONS, APRIL / MAY 2025

Biomedical Engineering
VII Semester
BM5008 BIOMETRIC SYSTEMS
(Regulation 2019)

Time: 3hrs Max.Marks: 100

CO 1	Demonstrate the principles of biometric systems.
CO 2	Develop fingerprint recognition technique.
CO 3	Design face recognition and hand geometry system.
CO 4	Design iris recognition system.
CO 5	Develop speech recognition and multimodal biometric systems.

BL – Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	How does the thermal imaging process work in capturing hand vein patterns for identification?	**2**	1	2
2	What are the key anatomical features of the ear used for biometric recognition?	**2**	1	1
3	List the factors responsible for intra-class variations in fingerprint matching?	**2**	2	1
4	Is fingerprint in palm region visible for person affected with psoriasis? Justify	**2**	2	2
5	Sketch the flowchart for hand feature extraction and matching	**2**	3	1
6	Outline the two main approaches to overcome the problem of pose and lighting variations in 3D Model based Face Recognition in Video.	**2**	3	2
7	Mention the two types of approach used in iris image acquisition.	**2**	4	1
8	What is the role of iris in human eye ?	**2**	4	2
9	Write a note on voice scan's strength.	**2**	5	2
10	Define Mel Frequency Cepstral Coefficients (MFCCs)	**2**	5	1

PART- B (5 x 13 = 65 Marks)
(Restrict to a maximum of 2 subdivisions)

Q. No	Questions	Marks	CO	BL
11 (a)	How do errors in biometric systems impact the accuracy and performance of biometric authentication? Explain using relevant performance metrics.	**13**	1	3
	OR			
11 (b)	Explain the generic biometric system.	**13**	1	3
12 (a)	Discuss the techniques used for fingerprint matching.	**13**	2	3
	OR			

12 (b)	Discuss the various technologies employed in the fingerprint scanning process and provide a comparison of the three main types.	**13**	2	3
13 (a)	Define the Fisher Linear Discriminant criterion and compute the linear discriminant projection for the following two-dimensional dataset: Class W_1: $X_1 = (x_1, x_2) =$ { (1, 2), (2, 1), (2, 3), (3, 2), (1, 3) } Class W_2: $X_2 = (x_1, x_2) =$ { (6, 5), (7, 8), (8, 6), (9, 7), (7, 6) }	**13**	3	4
	OR			
13 (b) (i)	Describe face recognition technique using shape and texture.	**6**	3	4
(ii)	Discuss face recognition performance using 3D model ? State its merits	**7**	3	4
14 (a)	Elucidate Daugman's approach of Iris Localization.	**13**	4	3
	OR			
14 (b)	Explain in detail the Wilde's approach of Iris localization and representation.	**13**	4	3
15 (a)	Elucidate the Gaussian Mixture Model based speaker recognition.	**13**	5	4
	OR			
15 (b) (i)	Explain about Mel Frequency Cepstral coefficient extraction from speech signal.	**7**	5	4
(ii)	Explain in detail about the tasks involved in the NIST annual evaluations and discuss about the performance measure.	**6**	5	4

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Consider a digital Medical image is acquired using DSLR camera in png format where RGB values are given as R= { [2, 0, 0] [0, 3, 0] [0, 0, 5] } G={ [1, 0, 0] [0, 4, 0] [0, 0, 2] }B= { [3, 0, 0] [0, 1, 0] [0, 0, 6]}.Calculate the eigen values ,eigen vectors and Eigen faces using Principal Component Analysis(PCA).	**15**	3	5