UNIVERSITY
OF
JOHANNESBURG

FACULTY OF SCIENCE

ACADEMY FOR COMPUTER SCIENCE AND SOFTWARE ENGINEERING

MODULE	IT00207 BIOMETRICS
CAMPUS	AUCKLAND PARK CAMPUS (APK)
EXAM	JUNE 2016

DATE	10/06/2016	**SESSION**	08:30-10:30

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EXTERNAL MODERATOR   PROF BL TAIT (UNISA)

DURATION 2 HOURS   **MARKS**   100

NUMBER OF PAGES: 4 PAGES

INSTRUCTIONS: ANSWER ALL THE QUESTIONS

REQUIREMENTS: AN EXAM BOOK FOR THE STUDENT

SECTION A - SHORT QUESTIONS

QUESTION 1
General Biometric Systems

(a) Discuss two (2) **differences** between token and biometric-based authentication systems, along when you would use each of them **instead** of the other authenticator. [4]

(b) Discuss with the aid of a diagram the core **components** found in any biometric system, along with which component you believe is the most prone **point of failure**. [6]

[10]

QUESTION 2
Fingerprint and Hand geometry

(a) Briefly describe four (4) **types** of sensors that can be used to capture samples in a **fingerprint** recognition system. [4]

(b) *"Many people believe that hand geometry has failed as a biometric for authentication."* Do you agree with this statement? Discuss **why** you agree or disagree with this statement. [4]

[8]

QUESTION 3
Face Recognition

(a) Discuss the **Viola and Jones** algorithm, along with it's **role** in face recognition systems. [4]

(b) Face recognition systems sometimes cause quite a stir among users, because a lack of user **acceptance**. Discuss why this the case, along what can be done to **improve** user acceptance for face recognition. [4]

[8]

QUESTION 4
Speaker Recognition

(a) Define the following terms within the context of speaker recognition: [3]
   1. PCM
   2. Timbre
   3. DFT

(b) Discuss the methods/ algorithms that can be used for **feature extraction** in biometric systems. [4]

[7]

QUESTION 5
Ocular Biometrics

(a) Describe the **capture** process in a **retina** recognition system. [2]

(b) Discuss the advantages **and** disadvantages of **iris** recognition in a biometric system. [4]

(c) Briefly describe **conjunctiva** recognition. [2]

[8]

QUESTION 6
Behavioural Biometrics

Gesture recognition-based biometric systems is one of the fastest growing technologies used in pervasive computing. One of the reasons behind this popularity can be attributed to the fact that these systems leverage natural movement by the user. Discuss the **categories** of gestures used in interactive systems, along with various **steps** required to capture, process and match a gesture sequence. For each step in your discussion be sure to elaborate on the following aspects:

- The different sensors that can be used to capture a sample.
- A brief description of the steps followed to process and match a sample.
- The algorithms used at each step (if necessary).

[8]

QUESTION 7
Multi-modal, Smart Card and Pervasive Systems

(a) Although multi-modal biometric systems are a great improvement in certain domains, there are times you simply need to say no to implementing a multi-modal system. Describe when you would **not** use a multi-modal biometric system. [3]

(b) List the three places where **comparisons** can be done in smart card-based biometric systems. [3]

(c) In your opinion, what do you think is the most **viable** biometric that uses a mobile phone? Make sure to justify your answer. [2]

[8]

QUESTION 8
Esoteric Biometrics and Privacy

(a) DNA is said to the perfect biometric. Why do you think DNA would be the "perfect" biometric and **why** has it has not been fully implemented yet? [4]

(b) Discuss **privacy** within the context of biometrics, along why it is **hindering** or preventing the uptake of biometric systems. [4]

[8]

SECTION B - LONG QUESTIONS

QUESTION 9

Vulnerabilities and Countermeasures
Draw an **attack tree** that highlights the **weaknesses** that will typically be found for a **palm vein** system **AND** provide a discussion on two **reasons** why you would want to subvert a biometric system and two ways to **safeguard** against them.

[10]

QUESTION 10

Recent improvements in the last decade have introduced a rich variety of technologies to the field of technology. However, with the sparse introduction of technologies, compatibility has not been a core concern, thereby making it difficult for deployments that spans different countries. Aside from these issues there are also overall **criticisms** of biometrics that are also holding it back from mass usage, but there have been **standardization** efforts that attempt to address these issues. Discuss these statements by paying special attention to the following:

- The standards found related to biometrics.
- The common criticisms of biometrics.
- Discuss the role standardization will play in biometric systems.

[10]

QUESTION 11

In these tough economic times deployment failure is a cost most companies simply cannot afford. This has increased the due diligence required for large scale deployments, along with further legal concerns that open them up for liability and increased scrutiny of certain vendor products through the use of detailed assessments. Comprehensively discuss **large-scale** biometric systems, **legal aspects** and **biometric evaluation**, by paying special attention to the following:

- The considerations one should make when deploying large-scale biometric systems.
- The metrics that should be used to evaluate biometric systems.
- The legal aspects related to deploying such a biometric system.
- Your opinion on how companies can save money when designing and implementing biometric systems.

[15]

— **End of paper** —