FACULTY OF SCIENCE

ACADEMY OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

MODULE	**IT00302/IT08X32** Critical Information Infrastructure Protection
CAMPUS	**APK**
EXAM SSA	**NOVEMBER 2020**

ASSESSORS:	MR SP SITHUNGU MR K LEBEA
MODERATOR:	PROF BL Tait
DURATION: 120 MINUTES	**MARKS:** 100

PLEASE TAKE CAREFUL NOTE OF THE FOLLOWING:

1. Write clearly and legibly.
2. Answer all the questions.
3. When done, save your work as a PDF and upload to https://eve.uj.ac.za/ → Practicals → Exam SSA.
4. Remember to download, complete and upload your Honesty Declaration to https://eve.uj.ac.za/ → Practicals → Honesty Declaration SSA.
5. Download time: 15 minutes.
6. Upload time: 15 minutes.

MEMO

QUESTION 1

1.1 As one of the country's Critical Information Infrastructure Protection practitioners, you have been approached to assist in implementing a CIIP strategy for Utopia. In order to lay a solid foundation, your first task is to write a report that describes and discusses CIIP as a means to help non-experts understand the need for CIIP. In your discussion you have been asked to ensure that the following aspects are included: **(25)**

- A definition of the term "Critical Infrastructure"
- Two examples of Critical Infrastructure (explain why each of your listed examples can be classified as Critical Infrastructure)
- Critical Infrastructure interdependencies
- A discussion of Critical Information Infrastructure and where it fits within the context of Critical Infrastructure
- Two examples of Critical Information Infrastructure Systems
- Types of attacks on Critical Information Infrastructure and possible consequences

Answer:

- 2 marks for defining critical infrastructure.
- 1 mark for each example of critical infrastructure
- 2 marks for explaining why each example is critical infrastructure
- 3 marks for 3 facts concerning CI interdependencies
- 10 marks for discussing critical information infrastructure (CII) - including defining what CII is – and explaining it in the context of critical infrastructure
- 1 mark for each example of a CI system (i.e. SCADA, EMS)
- 4 marks for 4 facts concerning the types of attacks in CII and possible consequences

QUESTION 2

2.1 In the context of South Africa, choose one type of information infrastructure which you deem critical and answer the following questions:

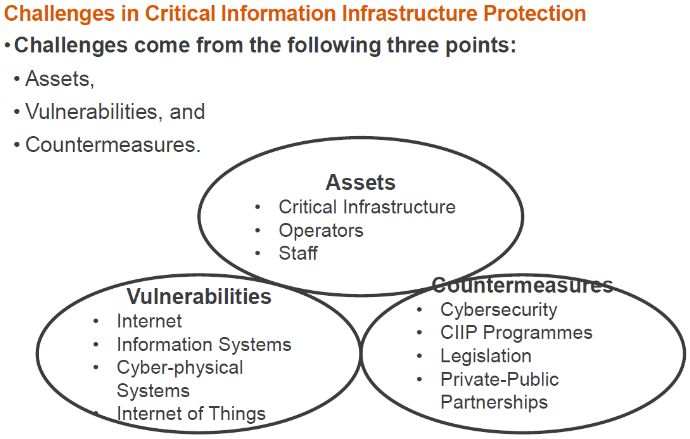
2.1.1 Name the chosen Critical Information Infrastructure (CII) **(1)**

2.1.2 Evaluate the criticality of the chosen CII in terms of: **(6)**
- What the **degree of disruption** to essential services would be if the CII was compromised
- The **extent of the disruption** in terms of **population** and **geographical** spread
- The **length of time** that the disruption would persist

2.1.3 Describe the challenges you believe to be currently faced by the CII in terms of **Assets**, **Vulnerabilities** and **Countermeasures**. **(10)**

Answer:

- **2.1.1:** Any infrastructure (e.g. power grid)
- **2.1.2:** 2 marks for each sensible evaluation (i.e. the total collapse of the power grid would cause a very high degree of disruption to essential services).
- **2.1.3:** Use the following diagram to assess the CII:



Challenges in Critical Information Infrastructure Protection

- **Challenges come from the following three points:**
  - Assets,
  - Vulnerabilities, and
  - Countermeasures.

Assets
- Critical Infrastructure
- Operators
- Staff

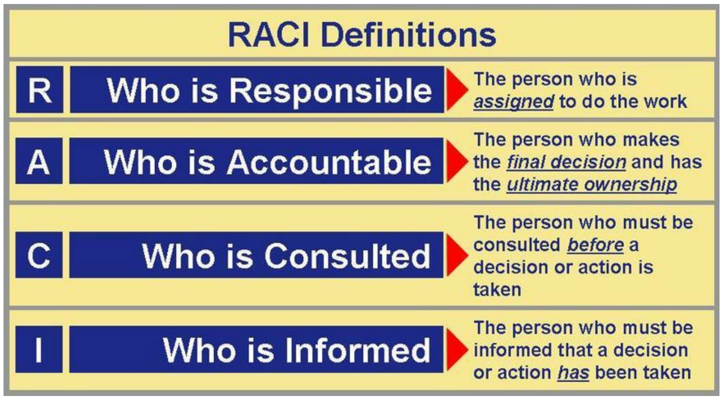
Vulnerabilities
- Internet
- Information Systems
- Cyber-physical Systems
- Internet of Things

Countermeasures
- Cybersecurity
- CIIP Programmes
- Legislation
- Private-Public Partnerships

QUESTION 3

3.1 Describe the public-private partnership (PPP) and explain why it would be beneficial in protecting your chosen CII in Question 2. **(4)**

3.2 Governance structures are crucial in the implementation and maintenance of CIIP in a country. Based on the RACI definitions shown in the figure below, explain how the government – along with the private sector – can realise efficient protection for your chosen CII in Question 2. Be sure to include all the aspects (i.e. RACI) in your discussion. **(10)**



RACI Definitions

R	Who is Responsible	The person who is *assigned* to do the work
A	Who is Accountable	The person who makes the *final decision* and has the *ultimate ownership*
C	Who is Consulted	The person who must be consulted *before* a decision or action is taken
I	Who is Informed	The person who must be informed that a decision or action *has* been taken

Answer:

- **3.1:** 2 marks for the definition of a PPP. 2 marks for 2 facts concerning the benefits of a PPP in protecting the CII.
- **3.2:** 2 marks for each of the aspects (R, A, C and I). 2 marks for a sensible discussion.

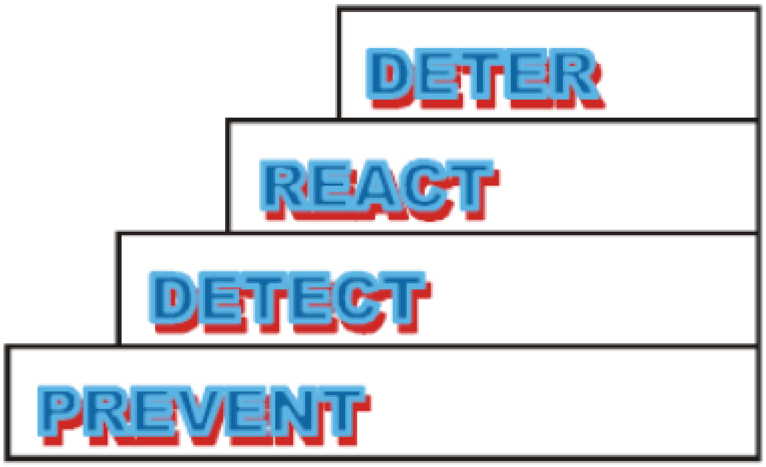
QUESTION 4

4.1 The Utopian Department of Cybersecurity has decided that the next phase of Utopia's CIIP strategy development is to establish a Computer Security Incident Response Team (CSIRT). You have been tasked with writing a concise report that explains the importance of a CSIRT to be distributed to all relevant stakeholders. The brief must include the following aspects: **(14)**

- A description of the term "Security Incident"
- The purpose of a CSIRT
- How incident management is more than just reacting (hint: refer to the relevant diagram)
- The principles of Incident Response.

Answer:

- 2 marks for describing a Security Incident.
- 4 marks for 4 facts concerning the purpose of a CSIRT.
- 4 marks for naming the concepts in the diagram below:



- 4 marks for briefly discussing each of the concepts in the above diagram.

QUESTION 5

5.1 Name and compare the two main Network Protection Strategies discussed in class. In your comparison, be sure to identify **at least one** strength and weakness of each strategy. **(8)**

5.2 In your opinion, how important is staff training as a Network Protection Strategy (refer to the class discussion on how humans can be the weakest link in an information security chain)? **(2)**

Answer:

- **5.1:** 2 marks for naming Uniform Access Management and Zoning/Variable Depth Security.
  4 marks for 4 facts that constitute a comparison of the two strategies
  4 marks for 4 facts concerning the strengths and weaknesses of the strategies (MUST be 1 strength and 1 weakness for each strategy).
- **5.2:** 2 marks for 2 facts relating to the class discussion.

QUESTION 6

6.1 In your own words, briefly describe the idea behind cyberwarfare. **(4)**

6.2 When countries engage in cyberwarfare, what is the main commodity that they are likely aiming to be superior in? **(1)**

6.3 Cyberwarfare is made possible through three key areas **preparation**, **offensive strategies** and **defensive strategies**. Discuss how each of these areas make cyberwarfare possible. **(9)**

6.4 Briefly describe the three remedies available under International Law in the case of cyberwarfare. **(6)**

Answer:

- **6.1:** 4 marks for 4 facts on cyberwarfare
- **6.2:** 1 mark for “information”. ½ mark for “data”
- **6.3:** 3 marks for 3 facts regarding each of the 3 concepts.
- **6.4:** 1 mark for mentioning each of the remedies (Self-Defence, International Criminal Court and European Convention on Cybercrime 2001). 1 mark for each brief description of each of the remedies.