

**SECTION A (ANSWER IN THE GREEN BOOKS)****TOTAL Marks for Section A: 30 Marks****Answer all questions in this section.****QUESTION 1 (Mr Cloete-Hopkins)**

- 1.1 What is a System?
- a) A construct or collection of elements
  - b) Results only obtainable through the sum of all the parts
  - c) The parts can include people, hardware, software, facilities, policies, and documents
  - d) All of the above
  - e) None of the above
- (1 mark)
- 1.2 What are included within the Systems Engineer's responsibilities on a project?
- a) Work with the project/programme manager
  - b) Domain specific engineering leadership
  - c) Only evaluate a specific solution, no alternatives
  - d) Develop and implement Information Technology (IT) solutions
  - e) All of the above
- (1 mark)
- 1.3 What is the purpose of a Systems Approach?
- a) Develop an understanding of the System-of-Interest only
  - b) Develop an understanding of the System-of-Interest within its Containing System only
  - c) Develop an understanding of the System-of-Interest and its Sub-Systems only
  - d) Develop an understanding of the System-of-Interest (including its Sub-Systems) and its Sibling Systems only
  - e) Develop an understanding of the entire systems hierarchy including interactions with other external systems and/or containing systems
- (1 mark)
- 1.4 According to INCOSE; which of these are NOT Systems Engineering functional area?
- a) Process Definition
  - b) Requirements Engineering
  - c) Architecture/Design Development
  - d) Schedule Control
  - e) Training
- (1 mark)

- 1.5 Which statement does not describe why we do Systems Engineering?
- a) Generation of potential credible system solutions taking account of System of Interest and Containing System
  - b) Determine and manage stakeholder viewpoints, concept of operations and translation of needs into requirements to develop a robust system
  - c) Address systems development through the project lifecycle
  - d) Analyse interfaces and system functionality to develop a solution that meets its key requirements
  - e) Integration and verification of the system elements taking account of inputs from differing discipline (1 mark)

**TOTAL: 5 Marks**

**QUESTION 2 (Mr Cloete-Hopkins)**

“The user should be able to select the temperature from within the room, using a touch-panel display, causing a response to occur in a timely manner.”

- 1. Identify what is wrong with this requirement (using INCOSE’s guide to writing good requirements). (2 marks)
- 2. Rewrite this requirement as one or more requirements. This may require you to provide (i.e. guess) additional information. (2 marks)

**TOTAL: 4 Marks**

**QUESTION 3 (Mr Cloete-Hopkins)**

Take any one or more real-world situation(s) and describe the concepts of verification, validation and emergent properties; specifically highlighting what was a “success” and/or failure. You may make use of the classroom examples.

- 3.1 What is Verification and Validation? (4 marks)
- 3.2 What are Emergent Properties? (3 marks)

**TOTAL: 7 Marks**

**QUESTION 4 (Mr Mudavahnu)**

- 4.1 Soft Systems Thinking, also referred to as Soft OR, refers to a number of approaches developed to deal with human and social aspects for which hard systems thinking was found to be inadequate, in particular when applied to complex problems that were messy and ill-defined and where conflicting viewpoints were held on the same issue (Daellenbach and McNickle, 2005). Outline with a brief explanation, three principles of systems thinking? (3 Marks)

- 4.2 Soft system methodology is helpful for knowledge elicitation in complex and poorly defined areas (Finegan, 1994). As a newly employed graduate in the strategic projects department of the state – the National Planning Commission, advise on what issues to consider for this scenario.

**Apply the soft systems approach – in particular Checkland’s SSM principles to explore this case.**

*It is required that accessibility of goods and services (malls among other channels being a preferred vehicle for such service delivery process) be spread all over the nation in particular in previously disadvantaged areas. But yet - the facts say for its population, South Africa has on average more malls than any country in the world. Its ranked number 6 in the world with Japan, China, USA included in the top 6, with over – 2000 malls all over the country. Is the Rapid Expansion of Malls in South Africa going to be problematic or not in future?*

Your answer should include the following:

- i. A Systems Hierarchy of which the systems is a part (3 Marks)
- ii. The Rich Picture showing the main Systems, Processes, Actors and the Views (5 Marks)
- iii. An outline of the Root Definition of one key Relevant System (3 Marks)

**TOTAL: 14 MARKS**

## **SECTION B (ANSWER IN THE YELLOW BOOKS)**

**TOTAL Marks for Section B: 40 Marks**

**Answer all questions in this section.**

### **QUESTION 1 (Strategic Planning – Prof. Brierley)**

- 1.1. Strategic Planning Process  
 Draw the diagram of the strategic planning process defining the steps in the process. (8 Marks)

- 1.2. Examples related to your own Department (Mech, Indust, Aero or Elec)
- i. Define a vision for the Department
  - ii. Define 2 Strengths, 2 Weaknesses, 2 Opportunities and 2 Threats for the Department
  - iii. Propose a Generic Strategy for the Department
  - iv. Define 1 Strategic Objective to build on one of the Strengths that you have defined, 1 to overcome a Weakness, 1 to capitalise on an opportunity and 1 to eliminate a Threat.
  - v. Define 1 Strategy for each Strategic Objective.

(12 Marks)

**TOTAL: 20 Marks**

**QUESTION 2 (Strategic Business Units – Prof. Brierley)**

You are required to enter the Strategic Business Units defined below onto the attached Boston Matrix and to define, in less than 30 words (3 lines), what action you would take with each of the Strategic Business Units.

- i. SBU A has a decreasing share of a growing market and accounts for 10% of the company's turnover.
- ii. SBU B has a slightly increasing share of a very fast-growing market and accounts for 10% of the company's turnover.
- iii. SBU C has an increasing share of a slightly growing market and accounts for 30% of the company's turnover.
- iv. SBU D has a very fast increasing share of a slightly declining market and accounts for 20% of the company's turnover.
- v. SBU E has slightly decreasing share of a market with neutral growth and accounts for 20% of the company's turnover.
- vi. SBU F has a very fast decreasing share of a declining market and accounts for 10% of the company's turnover.

**TOTAL: 12 Marks**

**QUESTION 3 (Motivation – Prof. Brierley )**

Analyse the motivation for the Cleaners in the building in which you are studying in terms of 2 of Herzberg's Motivating Factors and 2 of his Hygiene Factors. List each of your factors and explain your analysis in no more than 30 words for each factor.

Bonus Mark: Give the name of one of your Cleaners.

**TOTAL: 8 Marks**

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**STUDENT NUMBER:** \_\_\_\_\_

# Boston Consulting Group Matrix

## Worksheet



**Define the action you would take with each SBU**

SBU	Action you would take with the SBU
SBU A	
SBU B	
SBU C	
SBU D	
SBU E	
SBU F	