STRATHMORE UNIVERSITY
SCHOOL OF COMPUTING & ENGINEERING SCIENCES
COURSE: Masters in Sustainable Energy Transitions
Final Examination
MSSET 8301: INNOVATION & ENTREPRENEURSHIP

DATE: 17th April 2024 **TIME:** 18:00-20:30 Hours

Instructions
1. This is a supervised exam
2. Exam duration: 18.00 – 20.30 Hours
3. You are expected to work independently
4. Answer **Any Five** Questions

QUESTION 1: GII & National Innovation System (20 Points)
Table Q1 presents African countries within the top 100 in the Global Innovation Index (GII) 2023. The Global Innovation Index categorizes countries and regions according to their innovative capacity. To rank the countries, the index measures both innovation inputs and outputs. From the ranking of 2023 African countries start with Mauritius at number 57 and only eleven (11) countries are in the top 100 including Kenya which is ranked at number 100.

Table Q1: Global Innovation Index (GII) (2023)

Rank	Country	Overall Score
57	Mauritius	32.1
59	South Africa	30.4
70	Morocco	28.4
79	Tunisia	26.9
85	Botswana	24.6
86	Egypt	24.2
91	Cape Verde	23.3
93	Senegal	22.5
96	Namibia	21.8
99	Ghana	21.3
100	Kenya	21.2

a) Explain the role governments can play in determining the Global Innovation Index (GII) for countries. Consider the case of Kenya which comes at number 100 in the index for 2023 and discuss possible reasons for the poor performance for the country in the latest GII of 2023. **(10 Points)**

b) The Kenya's national innovation system was created by the Science Technology and Innovation (ST&I) Act 2013. The Act created three institutions within the Ministry of Education, Science and Technology to make the innovation system. These institutions include the National Commission for Science, Technology and Innovation (NACOSTI), the Kenya National Innovation Agency (KENIA) and the National Research Fund (NRF). Examine the role of national innovation system and how it contributes to the GII in the country. **(10 Points)**

QUESTION 2: Uncertainty Mitigation in the Innovation Process (20 Points)
Innovation is a process that involves an enormous amount of uncertainty, human creativity and chance. Recent research shows that a majority of innovation projects make little or no contribution to organizational goals or fail. Business incubation is a form of intervention that may be used to reduce the high failure rate of innovations.

a) Discuss in detail the role of business incubation in the innovation and entrepreneurship process. Analyze how incubators contribute to the national innovation systems by reducing uncertainty and risk thus allowing start-up businesses to grow. (**10 Points)**

b) Evaluate the various incubation program models that exist around the world and based on context and capabilities, make a recommendation on model(s) that may be suitable for Kenya. **(10 Points)**

QUESTION 3: Innovation & Entrepreneurship Process (20 Points)
Innovation is a process that involves an enormous amount of uncertainty and risk that influences entrepreneurship. The process may involve incremental, radical, or revolutionary changes in thinking, products, processes, or organizations.

a) Examine how the entrepreneurship process is influenced by innovation activities giving some examples of these activities. **(10 Points)**

b) Using examples from technology discuss what may be considered incremental, radical, or revolutionary innovations. **(10 Points)**

QUESTION 4: Sources of Innovation (20 Points)
The overwhelming majority of innovations exploit, change. There are some innovations that in themselves constitute a major change, such as the Internet. But these are exceptions and fairly uncommon. Most successful innovations are far more ordinary and they exploit change. Thus, the discipline of innovation which is the knowledge base of entrepreneurship is a diagnostic discipline: a systematic examination of the areas of change that typically offer entrepreneurial opportunities.

a) Discuss in detail the “unexpected success,” the “unexpected failure,” the “unexpected outside event,” and the “incongruity” as the most important sources of innovation that originate from within the enterprise. **(10 Points)**

b) As an external source of innovations, knowledge-based innovations are the super-stars of entrepreneurship and get the most publicity, money and attention. Examine in detail these types of innovations focusing on their characteristics and why they may be considered the most challenging. **(10 Points)**

QUESTION 5: Diffusion of AI Innovations (20 Points)

The following is an excerpt regarding ChatGPT and how the startup entered the artificial intelligence (AI) market and taken the space by storm. Read the excerpt and respond to the questions that follow.

ChatGPT is an artificial-intelligence (AI) chatbot developed by OpenAI and launched in November 2022. It is built on top of OpenAI's large language models (LLMs) and has been fine-tuned (an approach to transfer learning) using both supervised and reinforcement learning techniques. ChatGPT was launched as a prototype on November 30, 2022. It garnered immediate attention and large following for its detailed responses and articulate answers across many domains of knowledge. In a matter of days, ChatGPT had over one million users by December 4, 2022 and by January 2023, it had reached over 100 million users, making it the fastest growing consumer application to date with an estimated valuation of US$29 billion. The advent of ChatGPT and its introduction to the public has increased interest and competition in the AI space. In February 2023, Google finally introduced its experimental chatbot known as "Bard." Also in February, Facebook parent company Meta, released its own chatbot LLaMA. The Chinese corporation Baidu released in March 2023 a ChatGPT-style service called "Ernie Bot." The South Korean search engine firm Naver announced in February 2023 that they would launch a ChatGPT-style service called "SearchGPT" in Korean in the first half of 2023. The Russian technology company Yandex announced in February 2023 that they would launch a ChatGPT-style service called "YaLM" in Russian before the end of 2023.

a) With the help of sketches, discuss the possible growth stages of ChatGPT in the AI market, from its founding, growth and eventually taking OpenAI to IPO. What is ChatGPT's current growth phase? **(10 Points)**

b) Analyze the case of ChatGPT and explain why major innovations come from outsiders and not industry players whenever there is breakpoint in technology. For example, Google has been talking about AI for decades, and yet OpenAI, an upstart company, has taken the market by storm with its ChatGPT leaving Google gasping for air? **(10 Points)**

QUESTION 6: Dynamics of Innovation – Electric Car Technology (20 Points)

Typically, the process of innovation follows the S-growth curve which moves from start-up phase to rapid growth and eventually to decline in the mature phase. During the start-up phase a great deal of change in the product takes place but the outcome is highly uncertain in term of production, process, firm leadership and structure, and management. The process changes from start-up to growth phase which marks the start of fast growth. The acceptance of the innovation is pretty much assured and the focus of firms starts to shift from inventor's workbench to the factory floor. The following is an excerpt

regarding development in the electric vehicle technology. Read the excerpt and respond to the questions that follow.

Electric vehicle car (EV), battery electric vehicle (BEV) or all-electric vehicle (AEV) is an automobile that is propelled by one or more electric motors, using only energy stored in batteries. Compared to internal combustion engine (ICE) vehicles, electric vehicles are quieter, have no exhaust emissions, and lower emissions overall. Charging an electric car can be done at a variety of charging stations and these stations can be installed in both houses and public areas. Many countries have established government incentives for plug-in electric vehicles while others have legislated to phase-out sales of fossil fuel cars, to reduce air pollution and limit climate change. Tesla Model 3 became the world's all-time best-selling electric car in early 2020, and in June 2021 became the first electric vehicle to pass 1 million global sales. Together with other emerging automotive technologies such as autonomous driving, connected vehicles and shared mobility, electric cars form a future mobility vision called Autonomous, Connected, Electric and Shared (ACES) Mobility.

a) Explain the concept of dominant design as the innovation process moves from start-up phase to growth phase using the case of electric vehicle technology. What will be the impact of the dominant design on overall growth of the electric vehicle technology and industry? **(10 Points)**

b) Using the case of the automotive industry, discuss why changes in product and process become increasingly difficult as the innovation process moves through the growth to mature phase. What are the implications of the disruptive electric vehicle technology on the automotive industry? **(10 Points)**