Strathmore UNIVERSITY

STRATHMORE BUSINESS SCHOOL

BACHELOR OF SCIENCE IN SUPPLY CHAINS AND OPERATIONS MANAGEMENT

SCM 3106: INDUSTRIAL ECOLOGY AND INDUSTRIAL SYMBIOSIS

END OF SEMESTER EXAMINATION

DATE: Monday, 1st August 2022 **TIME**: 2 Hours

INSTRUCTIONS:

- **Answer questions ONE (Compulsory) and ANY TWO other questions**
- **Use the script below to answer question ONE.**

QUESTION ONE (30 marks)

China has implemented eco-industrial park (EIP) initiatives as a mainstream strategy of a circular economy since the turn of the new century. To facilitate EIP construction, the Chinese government issued a series of policies and regulations, including planning guidelines, technical standards and evaluation indicators. Up to 85 EIPs pilots have been established under the co-approval of three ministries, the Ministry of Environmental Protection (MEP), the Ministry of Commerce (MOC) and the Ministry of Science and Technology (MOST). One of the first three EIPs established was Tianjin Economic-Technological Development Area (TEDA) in December 6, 1984. It is considered 'economic powerhouse" in the northern China and the most talked about investment destination in Tianjin. TEDA is currently the largest and top ranking eco-industrial park in China gross by industrial output. Its outputs of mobile phones, flat-panel TVs and instant noodles all rank first in China. TEDA ranks as the top among industrial parks with revealed 81 inter-firm symbiotic relationships formed involving the utility, automobile, electronics, biotechnology, food and beverage and resource recovery clusters. Since 2010, TEDA implemented Industrial Symbiosis and Environmental Management System establishing an industrial symbiosis network with 800 member SMEs. In four years, TEDA had organized 464 onsite visits, 22 quick-win workshops and 14 sectoral seminars. The number of industry membership at TEDA increased to 931 in 2013 and Synergies established increased from 10 to 87 in the same year. TEDA achieved CO2 abatement from 2015 tons to 89,355 tonnes within the period 2010-2013 and raw material reduction from 50 tonnes to 936,000 within the same year. In 2012, its gross industrial output was RMB 710 billion, up 18% year on year. TEDA enjoys convenient transportation from the adjacent Tianjin Port, the largest seaport in North China by cargo throughput and Binhai International Airport, which is expected to become the largest air freight center in China. TEDA has dynamic labor markets, employment agencies and a complete database of professionals to recruit from around the country on a regular basis. TEDA Training Center provides regular professional training services and designs training specifically according to the actual needs for TEDA companies. TEDA kicked off construction of Nangang

Industrial Zone in 2009 comprising of a Terminal Storage, Modern Logistics Park and technology research.

(Adopted from HTDC news (https://hkmb.hktdc.com/en/1X09WMES/hktdc-research/Tianjin-Economic-Technological-Development-Area-TEDA-including-Tianjin-Nangang-Industrial-Zone and Shi, L., & Yu, B. (2014). Eco-industrial parks from strategic niches to development mainstream: The cases of China. *Sustainability*, *6*(9), 6325-6331. Accessed on July 4, 2022 at https://www.mdpi.com/2071-1050/6/9/6325/htm)

i. Justify the heavy investment in the Eco-Industrial Park (EIP) model by China. (4 marks)

ii. Discuss the evidence of system design thinking in the development of EIP as demonstrated in the script. (4 marks)

iii. Explore the Closed Loop Economy model at TEDA. (4 marks)

iv. Analyse the enablers for the success of TEDA as a top ranking EIP. (5 marks)

v. Highlight four achievements of TEDA as an Industrial Ecosystem (IE) that makes it the most talked about. (4 marks)

vi. Use examples to highlight three Industrial Ecosystem (IE) principles applied at TEDA. (5 marks)

vii. Explain three key features you expect at the Modern Logistics Park (4 marks).

QUESTION TWO **(20 marks)**

i. Discuss the key concepts in Design for Environment (DFE) in the product life cycle. (10 marks)

ii. Discuss any four DFE rules applicable to supply chain businesses. (10 marks)

QUESTION THREE **(20 marks)**

i. Explore five principles in Sustainability Design with direct applications in the supply chain sector. . (10 marks)

ii. Explain four applications of sustainable engineering in the supply chain sector. (10 marks)

QUESTION FOUR **(20 marks)**

i. Examine the conservation ethics of open space model strategy. (10 marks)

ii. Justify the need to plan for open spaces in industrializing cities. (10 marks)

QUESTION FIVE **(20 marks)**

i. Discuss five ongoing innovative initiatives to reducing supply chain emissions. (10 marks)

ii. Highlight possible solutions to the key challenges facing supply chains in the decarbonizing process. (10 marks)