



STRATHMORE UNIVERSITY
SCHOOL OF COMPUTING AND ENGINEERING SCIENCES
MASTER OF SCIENCE IN SUSTAINABLE ENERGY TRANSITIONS
END OF SEMESTER EXAMINATION
MSSET 8102
SUSTAINABLE ENERGY SYSTEMS AND SOCIETY

DATE: 8 December, 2023

Time: 18:00-20:30 Hours

Instructions: Answer question one (Compulsory) and two other questions

QUESTION 1

- a. Geothermal energy is used mostly for generation of electricity. Illustrate three common designs of Geothermal power plants. **[6 Marks]**
 - b. Explain the underlying technology, safety considerations, and environmental impacts associated with nuclear power plants. **[4 Marks]**
 - c. Explain the role of energy access in poverty alleviation. **[4 Marks]**
 - d. Discuss how widespread adoption of electric vehicles would influence urban planning, reduce air pollution, and affect the energy grid. **[6 Marks]**
- (Total Marks: 20)**

QUESTION 2

- a. Compare and contrast coal-fired and natural gas power plants as sources of base load electricity. The analysis should consider efficiency, environmental impact, and land footprint. **[8 Marks]**
 - b. Outline the potential of renewable energy sources, such as wind and solar power, in meeting base load electricity demands. Discuss the challenges and solutions for adopting these intermittent energy sources for base load power generation. **[7 Marks]**
- (Total Marks: 15)**

QUESTION 3

- a. The volume of viable deposits of primary energy sources such as natural gas and crude oil in sub-Saharan Africa is significant. In addition, the level of sunshine exposure is high. Despite this, the majority of inhabitants do not have access to electricity, and instead use biomass for cooking.
- i. Conduct an analysis of challenges that have led to this status. **[4 Marks]**
 - ii. Discuss measures that could be taken to develop the energy resources to benefit the countries in a sustainable manner. **[5 Marks]**
- b. Use diagrams to describe the design of gear-drive and direct-drive wind turbine. Explore considerations for construction of wind power plants using either gear-drive or direct-drive systems. **[6 Marks]**
- (Total Marks: 15)**

QUESTION 4

- a. Describe the key factors that drive energy demand in residential households in sub-Saharan Africa. **[4 Marks]**
- b. Describe the challenges and opportunities of transitioning to clean energy sources for cooking in sub-Saharan Africa. Your discussion should explore the gender, social, and economic impacts of this transition and provide examples of potential energy sources for specific countries. **[6 Marks]**
- c. Analyze the role of industrialization and economic activity in driving energy demand on a global scale. **[5 Marks]**
- (Total Marks: 15)**