



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: 15 August, 2023

Time: 18:00:20:30 Hours

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

QUESTION 1

- a. Solar and wind are experiencing rapid investment around the world in order to increase adoption of clean sustainable electrical power. Fluctuations in the generated power is a major challenge with these energy sources. Discuss how these energy sources can be integrated with other stable electrical power sources to achieve low cost sustainable energy for domestic, commercial and industrial sectors. **[5 Marks]**
 - b. In terms of impact to the environment, conduct an assessment of the suitability of the following energy sources with aim of limiting negative impact to the environment: biomass, coal, LNG, concentrated solar. **[5 Marks]**
 - c. Members of the society can be impacted by development of energy systems. This can be in the form of displacement from their homes or exposure to toxic pollutants. Discuss recommendations that should be considered when approving installation of a Liquefied Natural Gas (LNG) power plant, with respect to impact to society and power transmission requirements. **[5 Marks]**
 - d. Explore policies that sub-Saharan Africa (SSA) countries can adopt in order to develop their primary energy resources such as crude oil and natural gas and achieve sustainable development of their societies. **[5 Marks]**
- (Total Marks: 20)**

QUESTION 2

- a. The sustainability of an electrical power energy source requires assessment of its potential, environmental implications and other parameters. Discuss the key considerations in the construction of a hydro power plant. Explain the site selection process, the importance of environmental impact assessments, and other requirements for successful project implementation. **[8 Marks]**
 - b. The Kariba Dam in Southern Africa is an important source of renewable hydroelectric power for Zambia and Zimbabwe. The dam is undergoing maintenance to repair the plunge pool and ensure maximum lifetime. Discuss challenges that limit the expansion of hydropower projects in sub-Saharan Africa. **[7 Marks]**
- (Total Marks: 15)**

QUESTION 3

- a. In a sub-Saharan Africa country such as Tanzania that has vast LNG resources, discuss pathways that can be used to transition from domestic cooking with biomass to cooking with clean energy.
[8 Marks]
- b. Leadership can affect how a country benefits from its natural energy resources. Appropriate development of energy resources can spur industrial, economic and social development, create jobs and improve people's living standards. Despite existence of vast natural energy resources, a number of countries in sub-Saharan Africa experience civil conflict and insurgency relating to development of energy resources. Discuss approaches leaders can take to achieve the mentioned benefits.
[7 Marks]

(Total Marks: 15)

QUESTION 4

- a. Geothermal power generation systems use three main designs. With the aid of a diagram, explain the operation of each system and then conduct an assessment of the suitability of dry steam, flash steam and binary cycle systems using capital requirements and maintenance requirements.

[15 Marks]

(Total Marks: 15)