



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: 10th January, 2023

Time: 2.5 Hours

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

QUESTION 1

- a. Demand for energy e.g. electricity, coal, gas, diesel and petrol arises from sectors such as residential, commercial, industrial and transport. Select two sectors and Discuss how a combination of two or more of the energy sources can be used to meet demand for the sectors while minimizing adverse impact to the environment. **[6 Marks]**

 - b. In a country, that has vast Liquefied Natural Gas (LNG) and uranium deposits, identify and evaluate factors that should be considered in the development electrical power generation systems using these resources when considering a timeframe of 60 years. **[6 Marks]**

 - c. Solar and wind power are forms of renewable energy for which sub-Saharan Africa countries have large potential for electricity generation. In terms of operation costs and land foot-print, explore how any two countries in the region can effectively develop these forms of energy. **[8 Marks]**
- (Total Marks: 20)**

QUESTION 2

- a. The Grand Ethiopian Renaissance Dam (GERD) in Ethiopia is an important source of renewable hydroelectric power with an expected lifetime of over 100 years. Discuss challenges that limit the expansion of hydropower projects in sub-Saharan Africa. **[8 Marks]**

 - b. The majority of industrially developed countries have high economic growth and better quality of life. They rely on low cost of energy to power industrial processes. Despite having access to sources of low cost energy, a number of countries in sub-Saharan Africa experience the opposite of this. Discuss approaches policy makers and researchers can take to ensure these benefits are achieved while exploiting the energy sources. **[7 Marks]**
- (Total Marks: 15)**

QUESTION 3

- a. Conduct an assessment of below sources of energy for the generation of electrical power using the criteria of land foot print and impact on environment.
 - i) Geothermal **[4 Marks]**
 - ii) Wind **[4 Marks]**

iii) Solar

[4 Marks]

- b. Based on the assessment in (a) create a matrix where the three sources of electrical energy are ranked from 1 to 5 on the two criteria, with 5 being a high score of how good the energy source is in that criteria (e.g. if a source of energy has the least land foot print a score of 5 is awarded).

[3 Marks]

(Total Marks: 15)

QUESTION 4

- a. Pumped storage schemes offer a way of using surplus electrical energy to achieve some form of electrical power storage.

i. Use a diagram to illustrate the architecture of a pumped storage system and explain how it is used for electrical power generation. [6 Marks]

ii. Discuss consideration that can be adopted to make pumped storage systems sustainable and have greater benefit for the society. [5 Marks]

- b. 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. [4 Marks]

(Total Marks: 15)