



DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY
UNIVERSITY EXAMINATIONS 2021/2022 ACADEMIC YEAR
GEOTHERMAL ENERGY TRAINING AND RESEARCH INSTITUTE
FIRST YEAR EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE IN
GEOTHERMAL ENERGY TECHNOLOGY

GET 3001: INTRODUCTION TO GEOTHERMAL ENERGY

DATE: 20/09/2021

TIME: 09.00 A.M. - 12.00 P.M.

INSTRUCTIONS

- 1) TIME ALLOCATED – 3 hours
- 2) There are FIVE QUESTIONS in this paper
- 3) Attempt only THREE questions
- 4) Question 1 is compulsory and is worth 30 marks. The other two are 15 marks each
- 5) This Paper will count for 60% of the total score of GET 3001. The other 40% will be earned from CATS and assignments

Question 1 [30 marks] – This question is Compulsory

- a) The geothermal activity in the East African rift system is closely tied to the occurrence of Quaternary volcanoes located within the axis of the rifts. The shield volcanoes are largely made of trachytes, rhyolites and associated pyroclastics. Briefly discuss the role of these volcanic systems *[5 marks]*
- b) What are the Non-renewable Energy Resources? Why are they popular despite their negative environmental impacts? *[5 marks]*
- c) What are the Alternative or Renewable Energy Sources? And why are they being referred to as *Renewable*? *[5 marks]*
- d) East African Countries are advocating for Renewable Energy Technologies, can you advise on any shortcomings in their applications. *[5 marks]*
- e) How does the temperature gradient change with depth in the Earth? Why does this gradient vary from place to place across the earth's surface? *[5 marks]*
- f) Geochemical exploration relies on sampling and analysis of water, steam and gas from the thermal manifestation in order to characterize the fluids. What information can Geochemical exploration for geothermal resources provide? *[5 marks]*

Question 2 [15 marks] – This question is Optional

- a) How has utilisation of Geothermal Energy developed over the years in the world? Any challenges? *[5 marks]*
- b) According to some research workers Global energy demand increased at its fastest rate since 2010. The research teams say that development of renewable energy is “essential” and a “necessary step in securing our energy future.” What is your reaction to this assertion? That is, what’s your vision for a fossil fuel free future? *[10 marks]*

Question 3 [15 marks] – This question is Optional

- a) A power plant is an assembly of systems or subsystems to generate electricity. The type of geothermal power plant designed for a field depends on several factors. Name the three types of plants and the type of field (reservoir conditions/characteristics) they are constructed on. *[5 marks]*
- b) Expanded power generation may lead to increased demand for steam and reduced extra steam capacity. How can this be addressed? *[5 marks]*
- c) What 2 (two) major factors contribute towards making a geothermal field /geothermal reservoir suitable for generating electricity? *[5 marks]*

Question 4 [15 marks] – This question is Optional

- a) Drilling is the only sure way of proving a geothermal resource. What situations can give rise to a well not being productive? *[5 marks]*
- b) Discuss the application of geology, geophysics and geochemistry and for exploration of geothermal resources. Indicate any possible limitations *[10 marks]*

Question 5 [15 marks] – This question is Optional

- a) To attain vision 2030, Kenya has to increase electrical production to around 18,000MW to satisfy the projected power peak demands. Its main focus is in geothermal energy expected to contribute about 3000MW to the energy mix. This projection is slowly being met. Electrical power from geothermal resources is now around 1000MW. Present and explain how the Kenya government is achieving this. *[5 marks]*
- b) Outline the benefits that Kenya can get (or is getting) from direct applications of geothermal fluids. *[5 marks]*
- c) If you became employed as an earth scientist tomorrow by the Geothermal Division of the Kenya Electricity Generating Company, what are your expected routine jobs? *[5 marks]*