



100

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER
SUPPLEMENTARY/SPECIAL EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE
IN RENEWABLE ENERGY AND BIOFUELS TECHNOLOGY

COURSE CODE: IET 313

COURSE TITLE: GEOTHERMAL ENERGY

DURATION: 2 HOURS

DATE: 25TH SEPTEMBER 2017 **TIME:** 3 – 5PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 3 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

QUESTION ONE (30 MARKS)

- (a) (i) Define the following terms as applied to geothermal energy.
- I. geothermal flux; (4 marks)
 - II. enthalpy; (2 marks)
- (ii) Explain **two** ways in which geothermal systems are formed. (4 marks)
- (b) (i) Describe the siting process of determining a good exploration well. (4 marks)
- (ii) Briefly explain the following types of geothermal wells.
- I. temperature gradient wells;
 - II. production wells; (4 marks)
- (c) With the aid of labelled diagrams describe the following types of geothermal power plants.
- (i) flash steam; (8 marks)
 - (ii) binary cycle
- (d) (i) Outline the **three** objectives of geothermal well test analysis for electricity generation. (3 marks)
- (ii) Describe the actual field measurements that are made in exploration wells during the following stages:
- I. drilling;
 - II. completion. (5 marks)

QUESTION TWO (20 MARKS)

- (a) Explain the **three** main aspects of classifying geothermal resources. (6 marks)
- (b) Explain **three** conditions that are necessary for the existence of high enthalpy geothermal. (6 marks)
- (c) Describe the following geothermal resources:
- (i) vapour dominant reservoirs;
 - (ii) hot dry rocks. (8 marks)

QUESTION THREE (20 MARKS)

- (a) Outline **four** features of a good geothermal reservoir for generating electricity. (4 marks)
- (b) Highlight the advantages and disadvantages of geothermal power generation. (8 marks)
- (c) Explain **four** reasons why Geothermal holds great potential as a renewable energy resource. (8 marks)

QUESTION FOUR (20 MARKS)

- (a) Explain the most important modes of heat transfer in a borehole heat exchanger. (6 marks)

(b) Describe the construction and operation of a ground source heat pump. (10 marks)

(c) List any **four** direct applications of geothermal energy in Kenya. (4 marks)

QUESTION FIVE (20 MARKS)

(a) State any **four** factors to be considered in choosing reservoir mapping methodology. (4 marks)

(b) With the aid of a diagram illustrate how the temperature varies with depth in the earth.(6 marks)

(c) Explain any **five** objectives of each of the following mapping techniques in geothermal exploration.

(i) geochemical mapping;

(ii) geophysical mapping;

(10 marks)