



**DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY**

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**UNIVERSITY EXAMINATIONS AY 2019/2020**

**FIRST YEAR SECOND SEMESTER EXAMINATIONS FOR THE DEGREE  
OF MASTER OF SCIENCE IN GEOTHERMAL TECHNOLOGY**

**GET 3009: STEAM FIELD & GEOTHERMAL POWER PLANTS**

**DATE: 28/9/2020**

**TIME: 9AM-12PM**

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**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 3010. The other 40% will be earned from CATS and assignments

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Question 1 [30 marks] – This question is Compulsory

a) Name any 3 planned main components of a geothermal steam field and any 2 planned power plant components. [5 marks]

b) As a steam field engineer, what would be your main job descriptions? [5 marks]

c) Name any FIVE factors that need to be considered when designing steam-lines for a single-phase flow fluid transmission in a steam line? [5 marks]

d) As fluids flow in a steam line *pressure* tends to drop. Name *three factors* that may give rise to this drop. [3 marks]

One of the equations used in determining pressure drops in steam lines is

$$\Delta P_f = \rho g H_f$$

Define the quantities  $\rho$ ,  $g$ , and  $H_f$  [2 marks]

e) Expanded power generation may lead to increased demand for steam and reduced extra steam capacity. How can this be addressed? [5 marks]

f) Discuss how water condensate can be formed from an initially dry steam in a pipeline. Why is it necessary for this condensate to be removed before the steam reaches the power house? *[5 marks]*

Question 2 [15 marks] – This question is Optional

Name and discuss THREE challenges commonly face by as steam field operator in geothermal steam-field management. How are these addressed? *[15 marks]*

Question 3 [15 marks] – This question is Optional

- a) Describe THREE Types of Geothermal Energy power plants systems and their mode of operation. Figures would help clarify your answer. *[5 marks]*
- b) What are the strong points on each of these plant types? *[5 marks]*
- c) What are their limitations? *[5 marks]*

Question 4 [15 marks] – This question is Optional

Imagine you have been appointed as Chief Engineer of the newly commissioned Olkaria 5 (172 MWe) Geothermal Power Plant. Discuss what activities / measures that you plan to put in place to keep it producing power for a long period of time? Include in your discussion scenarios such steam output decline, breakdowns and human capacity challenges. *[15 marks]*

Question 5 [15 marks] – This question is Optional

- a) Briefly discuss the use of and operations of the power plant components - turbines, generators, separators and cooling towers. *[10 marks]*
- b) What determines their designs? *[5 marks]*