



# DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY

UNIVERSITY EXAMINATIONS 2021-2022 ACADEMIC YEAR  
YEAR ONE SEMESTER ORDINARY EXAMINATIONS  
FOR THE DEGREE IN MASTER OF SCIENCE IN GEOTHERMAL ENERGY TECHNOLOGY

## GET 3007 – DRILLING ENGINEERING

DATE: 11/01/2022

TIME: 11AM-2PM

### 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 3007 The other 40% will be earned from CATS and assignments

Question 1 [30 marks] – This question is Compulsory

- (a) Figure 1 represents the structure of a rig. Name and state the functions of parts 1, 10, and 23. [5 marks].

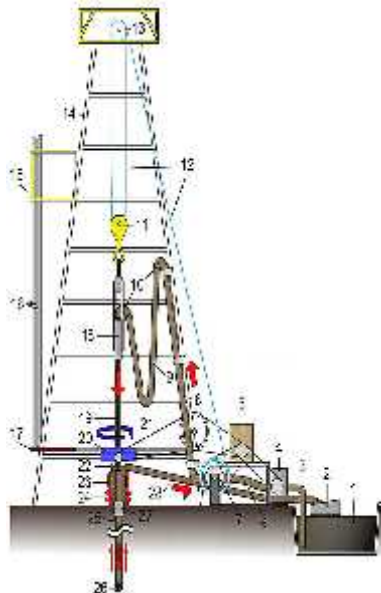


Figure 1: Rig structure

- (b) During drilling, a number of parameters are monitored. State any FIVE and give the reason for such a measurements. [5 marks].
- (c) What are the advantages of carrying out directional drilling? What are the setbacks? [5 marks]

- (d) Drilling fluids are an essential component in the circulation system. Give FIVE reasons why they are used. [5 marks]
- (e) During drilling, some preliminary events may occur that could be associated with the well developing a control problem. An example could be pit gain or the well flows after mud pump has been shut down. Give THREE more [5 marks]
- (f) Quantitative analysis of well logs provides the analyst with values for a variety of primary parameters, such as: porosity, water saturation, fluid type (oil/gas/water/steam), lithology and permeability. Given the logs indicated in Figure 2, discuss the possible type of formation around depth 4200 in terms of porosity, storability and permeability. Hint: values are increasing to the LEFT. [5 marks]

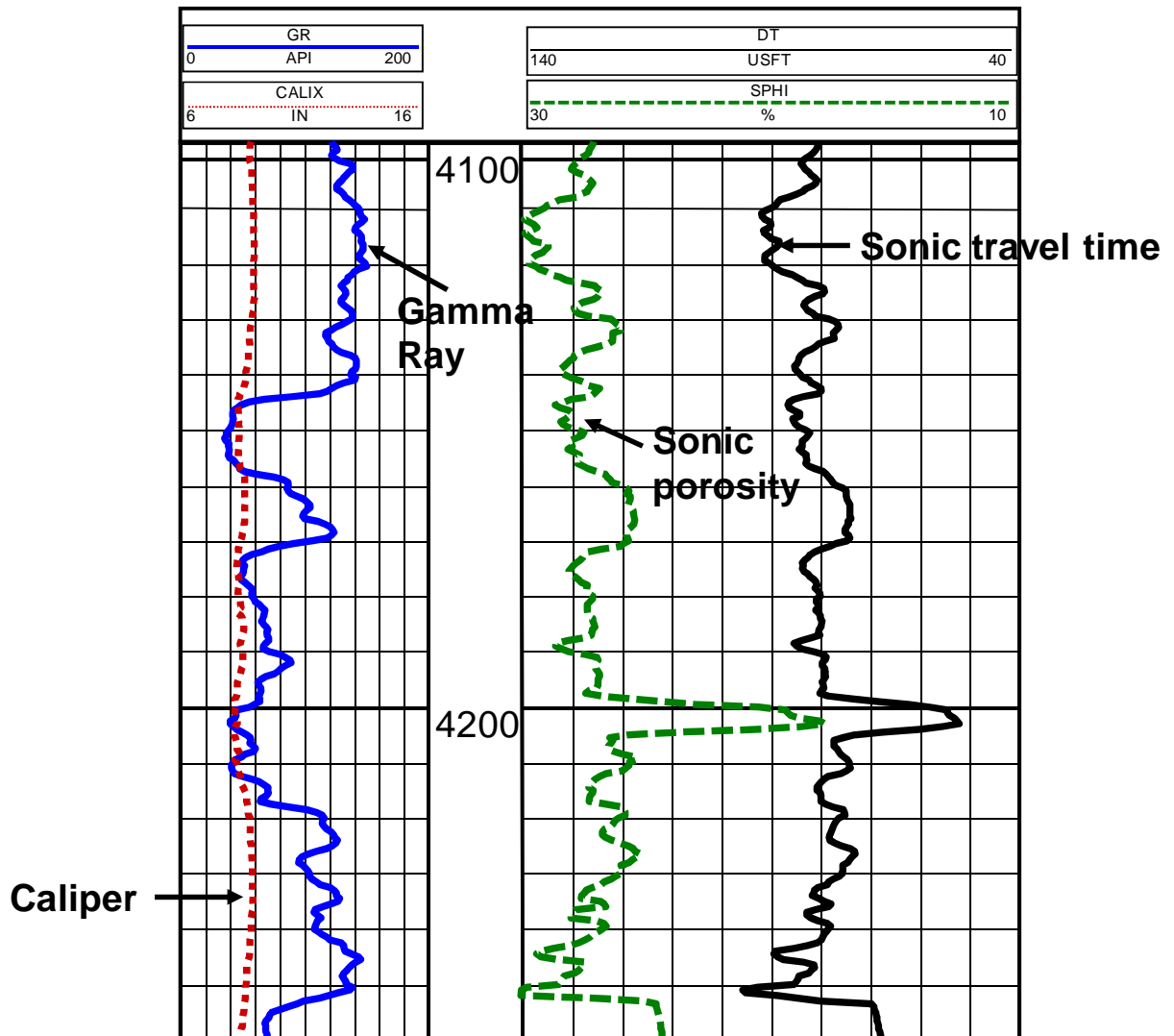


Figure 2: Well logs

Question 2 [15 marks] – This question is Optional

- (a) Explain why geothermal developers lay a lot emphasis on adequate and quality surface data collection before committing funds to drilling. *[5marks]*
- (b) A rig must hoist a load of 300,000 lbf. The draw-works can provide an input power to the block and tackle system as high as 500 hp. Eight lines are strung between the crown block and travelling block. Explain why the maximum hook horsepower available is less than 500 hp (actual figure is 420.5 hp). *[5 marks]*
- (c) Given that the maximum hoisting speed is 46.3 feet/minute in the situated presented in part (b), determine how long it would take to pull a 90-ft stand. *[5 marks]*

Question 3 [15 marks] – This question is Optional

- (a) In drilling operations, Safety Considerations are important. Summarise the risks in drilling and how these can be addressed. *[10 marks]*
- (b) Discuss how a well being drilled can go out of control. What are possible solutions to this scenario? *[5 marks]*

Question 4 [15 marks] – This question is Optional

- (a) Explain THREE reasons why a casing string is run in a well-bore *[5 marks]*
- (b) State 5 factors /criteria (excluding finances) that can determine the limits of the total depth of the well to be drilled. *[5 marks]*
- (c) Why is it that it is not possible to procure a drill rig “off the shelf”, i.e., one has to order for it to be built from scratch? *[5 marks]*

Question 5 [15 marks] – This question is Optional

- (a) Bit selection can be a very complex procedure if all the factors quoted by manufacturers were to be evaluated. Suggest and discuss any 2 attributes of a drill bit you would consider important and why? *[5 marks]*
- (b) Provide and discuss TWO industry methods in dealing with Well Control. *[5 marks]*
- (c) Fishing may take up-to 20% of the time taken to drill a well. This time may be described as a none-productive activity. Give another TWO major none-productive (but necessary) activities and Analyse why they are necessary? *[5 marks]*