



KISII UNIVERSITY
UNIVERSITY EXAMINATIONS
FOURTH YEAR EXAMINATION FOR THE AWARD OF THE
DEGREE OF BACHELOR OF SCIENCE
SECOND SEMESTER 2022/2023
[JANUARY-APRIL, 2023]

BSMN 428: BOREHOLE GEOPHYSICS

STREAM: Y4S2

TIME: 2 HOURS

DAY: THURSDAY, 12:00 – 2:00 PM

DATE: 06/04/2023

INSTRUCTIONS

1. *Do not write anything on this question paper.*
2. *Answer question ONE and any other TWO questions.*

QUESTION ONE (30 MARKS)

- a) Define Borehole geophysics (2marks)
- b) Complete the table below appropriately (14marks)

	CATEGORY	GEOPHYSICAL METHOD	RELATED ROCK PHYSICS PROPERTY	GEOPHYSICAL INSTRUMENT	SI UNIT
1	Potential Fields				
2	Diffusive Fields				
3	Wave Propagation				

c) Define the following terminologies as used in borehole geophysics (4marks)

i. Porosity

ii. Permeability

d) What are the two general types of log mechanism (2marks)

e) State the importance of geological well logging (6marks)

f) Differentiate between invaded zone and uninvaded zone (2marks)

QUESTION TWO (20 MARKS)

a) Why is formation evaluation necessary (4marks)

b) Differentiate the following as used in formation evaluation (4marks)

i. Mud logging

ii. Coring

c) Once the core is retrieved to the surface it is usually prevented from drying out, coming into contact with oxygen or being mechanically damaged. State the ways in which the preservation is achieved (3marks)

d) State the categories of core analysis (2marks)

e) Outline the information provided by core analysis (7marks)

QUESTION THREE (20 MARKS)

a) Define formation testing and state the three methods used in formation testing (5marks)

b) Outline the categories of well logging techniques giving examples. (6marks)

c) Briefly discuss the following well logging techniques (9marks)

i. Neutron log

ii. Density log

iii. Resistivity log

QUESTION FOUR (20 MARKS)

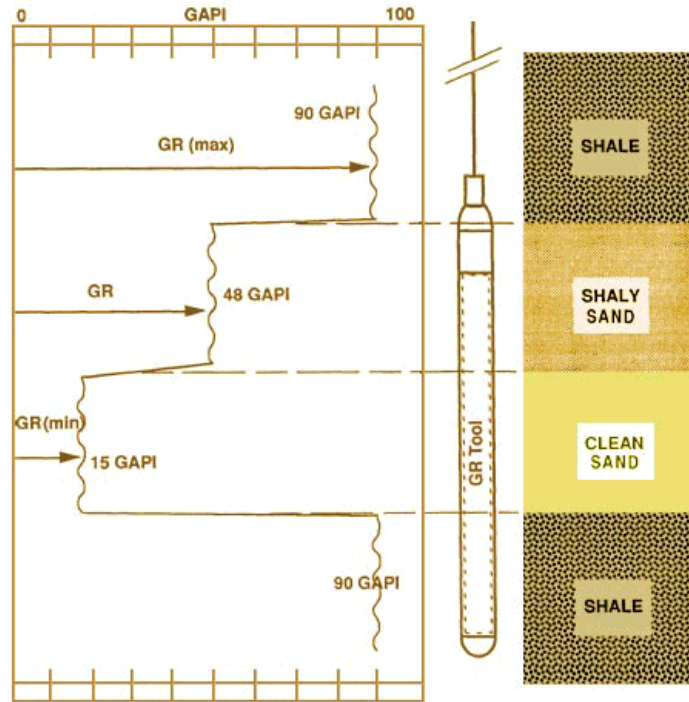
- a) Outline the basic well logging tools (9marks)
- b) Define a 'Sonde' as used in well logging (2marks)
- c) What is the function of a depth calibration wheel (1mark)
- d) Fill in the following table with the function of the indicated well logging tool (8marks)

NO	LOGGING TOOL	PARAMETER MEASURED
1	Caliper	
2	Spontaneous Potential - SP	
3	Gamma Ray	
4	Laterolog	
5	Induction	
6	Neutron	
7	Density	
8	Sonic	

QUESTION FIVE (20 MARKS)

- a) What is well log interpretation (2marks)
- b) Write down and define the parameters in the formulae for determining the following (9marks)
- Formula for determining the shale content(shale volume) using a gamma log
 - Formula for determining porosity using density log
 - Formula for determining porosity using a sonic log
- c) Using the formula in (i) above, calculate the shale volume as indicated in the GR log below (2marks)

Typical Gamma Ray Responses



d) State the application of borehole geophysics in each of the following (7marks)

No	Type of study	Borehole geophysics application
1	Lithological	
2	Environmental	
3	Water resources	
4	Geotechnical	
5	Mineral	
6	Geothermal	
7	Hydrocarbon	