

Benha University

Faculty of Science

Dept. Of Geology



Time: two hours.

First Semester 2018-2019

Date: 13/1/2019

Introduction to well logging (459G) for Fourth Level Students (Geophysics)

جامعة بنها – كلية العلوم – قسم الجيولوجيا

المستوى الرابع (جيوفيزياء)

يوم الامتحان: الاحد

تاريخ الامتحان: 2019 / 1/ 13

الماده: مقدمه فى سجلات الابار (459 ج)

الممتحن: د/ وفاء الشحات عفيفى الشحات

أستاذ مساعد بقسم الجيولوجيا بكلية العلوم

الاسئلة ونموذج الاجابه

ورقه كامله

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Answer four questions of the following *including question. 3*:

Question1. (12Marks)

What are the purposes or the importance of running the following logs?

- 1) Caliper log 2) Gamma Ray log 3) Sonic log 4) Density log
5) Neutron log 6) spontaneous potential log

Question2. (12Marks)

1. What two types of waves are generated by the acoustic tool?
2. How is the neutron tools calibrated?

Question 3. (12 Marks)

****Define six terms of the following:***

- a) Sour gas and sweet gas
- b) Cased holes,
- c) A logging unit,
- d) Measuring While Drilling (MWD),
- e) Dual Laterologs: (DLL),
- f) Gross thickness
- g) Gas Analyzer,
- h) Cavings.
- i) Clean formation

Question 4. (12 Marks)

Explain the principle of Gamma Ray Log. Describing clearly the different sources of radiation in the subsurface

Question 5. (12 Marks)

Give Reason:

- a) The drilling mud must be dense and viscous
- b) Bentonite, Barite and caustic Soda should be added to mud fluid.

BEST WISHES

د. وفاء الشحات عفيفي

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Answer of Question1. (12 Marks)

What are the purposes or the importance of running the following logs:

1. **Sonic log** can be used to determine formation porosity, lithology, and rock compressibility, cement bond quality (CBL). The sonic log is used to evaluate porosity in liquid filled pores. The sonic tool is only capable of measuring travel time.

2. Gamma Ray log

-Identifying permeable and non-permeable zones -Estimating shale volume -Identifying lithology -Correlation between formation

3. **The density log** is a tool that measures the electron density of the formation by emitting GR into formation, Density logs are run in open hole, and are used as:

-Porosity logs- An identifier of minerals- Detector of gas-An evaluating of shale

4. **Neutron logs** are porosity log that essentially measures the hydrogen concentration in the formation. In clean formation, when the pore spaces are filled with water or oil, the neutron log measures liquid filled porosity

5. A **caliper log** is a set to measure of the size and shape of a bore hole commonly made when drilling oil and gas wells. This can be an important indicator of cave in or shale swelling in the bore hole.

6. **Spontaneous potential log** discrimination between shaly and clean formations, correlation

Answer of Question2. (12 Marks)

1. What two types of waves are generated by the acoustic tool?

· The three waves of importance produced downhole are the compressional (Pwave) which arrives first, the Shear (Swave) and the Stoneley Wave .

2. How is the neutron tools calibrated?

· These tools are calibrated in the University of Houston's API test pit which contains carbonates of known porosities. The porosities are given in limestone porosity units. If the matrix is not limestone, empirical corrections are made to correlate the porosity to the proper lithology.

Question 3. (12 Marks)

Define:

a) **Sour Gas:** Gas that contains Hydrogen Sulphide

Sweet Gas: Gas that contains little or no Hydrogen Sulphide

b) **Cased holes,** Casing is thin-walled, steel pipe that is run in the hole to prevent borehole collapse as drilling progresses. The casing is cemented (cement job) to the borehole wall.

- c) **A logging unit**, is an instrument for taking measurements. For land rigs, the unit is mounted on a truck. The logging Truck mainly consists of mechanical Winches and ordinary driving machine.
- d) **Measuring While Drilling (MWD)**, It is the evaluation of physical properties, usually including pressure, temperature and wellbore trajectory in three-dimensional space, while extending a wellbore. MWD is now standard practice in offshore directional wells.
- e) **Dual Laterologs: (DLL)**, It is the latest version of the laterolog. As its name implies, it is a combination of two tools, and can be run in a deep penetration (LLd) and shallow penetration (LLs) mode.
- f) **Gross thickness**, thickness of a zone between two geological horizons or markers
- g) **Gas Analyzer**, It analyzes hydrocarbon gases in mud & detects Hydrogen Sulphide & Carbon dioxide (Non hydrocarbon Gases).
- h) **Cavings**. cuttings from previously drilled intervals rather than from the bottom of the hole.
- i) **Clean formation** a formation that does not contain any shale.

Question 4. (12 Marks)

Explain the principle of Gamma Ray Log. Describing clearly the different sources:

Gamma ray is high-energy electromagnetic waves which are emitted by atomic nuclei as a form of radiation (Gamma-Radiation). Gamma ray logging is measurement of natural radioactivity in the formation versus depth this radiation is in fact emitted from three main types of source elements:

40K(Potassium), 232Th (Thorium) or 238U (Uranium) and their decay products as sources.

Question5. (12 Marks)

Give reason:

- a) The drilling mud must be dense and viscous to carry cuttings & keep it from filling
- b) Bentonite, Barite and caustic Soda should be added to mud fluid (mud additives)

Bentonite is used to increase the Viscosity, **Barite is** used to increase the Density and **Caustic Soda** is used to increase the Alkalinity