2901/303
PETROLEUM EXPLORATION
AND DRILLING
Oct./Nov. 2022
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN PETROLEUM GEOSCIENCE

MODULE III

PETROLEUM EXPLORATION AND DRILLING

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet;
A non programmable scientific calculator..
*This paper consists of **EIGHT** questions.*
*Answer any **FIVE** questions in the answer booklet provided.*
Maximum marks for each part of a question are as indicated.
Candidates should answer the questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. (a) (i) Define a kick.

(ii) State **four** ways of labelling kicks based on the type of formation fluid. (3 marks)

(b) Explain kick detection and monitoring with measurement while drilling (MWD) systems monitor. (7 marks)

(c) Describe **four** causes of kicks. (10 marks)

2. (a) Describe **three** types of blow outs in oil wells. (9 marks)

(b) (i) Explain **three** natural factors which cause wellbore instability.

(ii) State **four** types of borehole instability. (11 marks)

3. (a) Describe wireline logging as a method of evaluating oil wells. (6 marks)

specific depths

(b) List **four** categories of information tools can provide about the conditions at the drill bit in measurement while drilling (MWD). (2 marks)

(c) Explain the following methods of data transmission in MWD tools:

(i) mud-pulse telemetry method;

(ii) electromagnetic telemetry;

(iii) **wired drill pipe.** (12 marks)

4. (a) With reference acreage acquisition in oil exploration:

(i) Describe work program bidding;

(ii) Explain each of the following:

(I) farm - in;

(II) farm-out. (12 marks)

(b) (i) Describe joint venture as a concept in acreage acquisition and legal aspect for petroleum exploration.

(ii) State **four** advantages of joint ventures. (8 marks)

5. (a) Discuss the reporting requirements for petroleum drilling activities. (13 marks)

(b) Various rules and regulations have to be observed during petroleum drilling operations.

(i) State **four** pollution prevention and control measures to be considered prior to discharge of spent drilling fluids and drilled cuttings.

(ii) State **three** principles to be followed for the management of hazardous materials offshore. (7 marks)

6. (a) (i) Describe what is involved in well planning.

(ii) State **six** factors which affect well costs. (8 marks)

(b) Explain the objectives of well planning. (6 marks)

(c) Explain the process of making a hole in oil well drilling. (6 marks)

7. (a) (i) Describe rotary drilling method.

(ii) State **four** advantages and **two** disadvantages of rotary drilling method. (11 marks)

(b) Explain the following main components of a rotary drilling rig:

(i) Hoisting system;

(ii) rotation system;

(iii) circulating system. (9 marks)

8. (a) Explain each of the following:

(i) well completion;

(ii) steps involved in well completion process;

(iii) **five** expected outcomes for a completed well to be deemed successful. (17 marks)

- Pressure maintenance
-

Turn over

(b) Figure 1 shows a horizontal completion of an oil well. Identify the part labelled A, B, C, D, E and F. (3 marks)

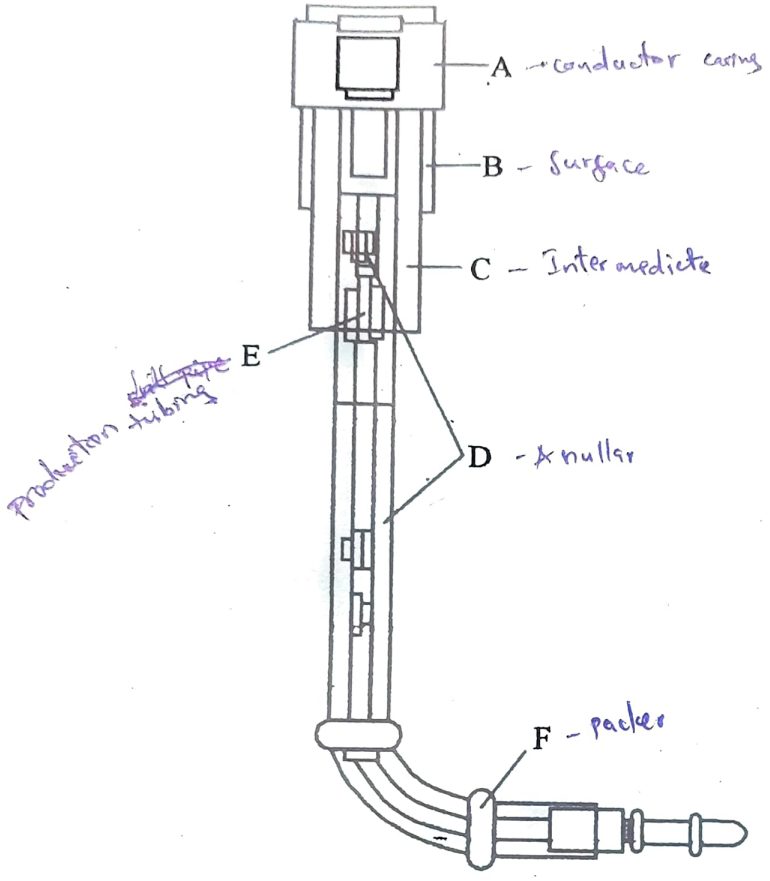

Fig. 1

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