UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, DEC 2014

COURSE NO: **PE 273**
COURSE NAME: **DRILLING FLUID**
CLASS: **PE II** TIME: **3 HOURS**

Name**:** _____Index Number: _____

ANSWER ALL QUESTIONS

SECTION A (2 marks each for each correct answer)

1. What is a drilling fluid or mud?

2. There are a number of functions of a drilling fluid but what is/are the primary function?

3. What is hydrostatic pressure?

4. ……..is when a pipe is run into a hole the pipe displaces fluid, causing it to flow up the annulus whiles …….is when a pipeis pulled from a hole resulting in mud falls under its own weight to fill the void volume left by the pipe.
5. List an three problems that can occur as a result of inefficient cutting transportation:
   a.
   b.
   c.
6. List any four easy to enhance cuttings transportation.
   a.
   b.
   c.
   d.
7. Which of the types of the drilling fluids is the most extensively used and Why?
   a.
   b.

8. Give one disadvantage of using water base mud to drill.

9. List the two reasons for adding clay materials to drilling fluids.
    a.
    b.

10. A …….. is normally a very simple inexpensive fluid for drilling the first and sometimes second intervals from surface of a wellbore.
11. What is the main function of adding barite to a drilling fluid?
    a.
12. …… is the major additive used to keep the pH of the mud high which must be kept between …….. and ……...
13. ……..are used generally for drilling depleted zones or areas where abnormally low formation pressures may be encountered.
14. …… is use to control hydratable behaviour of reactive shales
15. Clay minerals have a sandwich-like structure usually consisting of **……** layers. The alternate layers are of ……. and ……..
16. What is the function of sodium in a clay layer?

17. List any three undesirable solids present in the mud?
    a.
    b.
    c.
18. List any two challenges the presence of these undesirable solids in a mud may result in?
    a.
    b.

19. What is Gel strengths of a drilling fluid?

20. What is plastic viscosity of a drilling fluid?

SECTION B (5 marks each for each correct answer)

1. Sketch the side view of a water drop that is trapped in a strongly oil wet capillary tube showing the quantum of the contact angle.

2. Group the following terminologies under two columns: high-swelling clay, low-swelling clays, contaminants, Expandable clays,hydrophobic, montmorillonite, hydrophyllic, Non-expandable.

3. In water, clay layers absorb water, causing chemical bonds holding them together to ……..and the stack of layers (face-to-face arrangement)disintegrates resulting in the ……. of the aggregated clay particles. ……. may be achieved again by introducing cations (e.g. Ca^{2+}) to bring the plates together. Some plates will tend to form edge-to-face arrangements known as ……... Chemicals called "thinners'' are added to the mud to …….. the particles.

SECTION C

1. A Retort analysis gave the following results: % by volume oil/water/solid = 60/20/20 In increasing the oil/water to 85/15, what should be the volume of oil to be added? Prove that the volume of oil computed is accurate.**(10 Marks)**
2. State five (5) factors you would consider when selecting a drilling fluid for a particular formation. Give one reason for each factor. **(10 Marks)**
3. The dial readings from a VG of a certain mud property gave the following reads at 600 and 300 respectively; 70 and 45. **(15 Marks)**
    a. Determine whether this fluid is Newtonian or not.
    b. What is the plastic viscosity and yield point?
    c. Prove whether the fluid is very viscous or not.
4. Suppose your company utilizes the following equation to estimate the volume of solids entering a mud:

$$V_c = \frac{(1-\emptyset)d^2(ROP)}{1029}$$

V_c = volume of cuttings (bbl/hr)

θ = average formation porosity

d = hole diameter (in)

ROP = rate of penetration (ft/hr)

Given that the hole diameter is 26 inches and 2 hrs was taken to drilled a TVD of 124 ft with an estimated Pore volume of 100 ft^3 whiles the Bulk volume of the rock was 400 ft^3. Estimate the volume of cuttings. **(10 marks)**

NOTE:

1 g/cm^3 = 62.43 lb/ft^3 1 ft^3 = 7.4805 *gal* *42 gallons = I barrel*

1.0 *in* = 0.08333 *ft* 1 *m* = 3.28083 *ft* *pv = Φ600 – Φ300*

1ft = 304 800 micron 1 inch = 25 400 micron 1g/cm^3= 8.345 lb/gal

1 g/cm^3 = 62.43 lb/ft^3 1 ft^3 = 7.4805 *gal* 1 *in* = 0.0254 *m*

$$K = \frac{\emptyset_{300}}{511^n} \qquad n = 3.32log\frac{\emptyset_{600}}{\emptyset_{300}}$$

Broni-Bediako