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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

MID TERM EXAMINATION

Winter Semester: 2021 - 22

Course Code: PET 2001

Course Name: Drilling Fluid Technology

Program & Sem: B.Tech. (PET) & II

Date: 14/May/2022

Time: 10:00 AM – 11:30 AM

Max Marks: 50

Weightage: 25%

Instructions:

- (i) Read the all questions carefully and answer accordingly.
- (ii) Question paper consist of three parts, PART A, B & C
- (iii) All questions are mandatory

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries TWO mark.

(10Qx 2M= 20M)

1. Arrange the following mud in the increasing order of harmfulness to environment.
“Synthetic mud, APHRON, Native mud, Diesel, Polymer added WBM” (C.O.No.1) [Knowledge]
2. Define COLLOID and FOAM. (C.O.No.1) [Knowledge]
3. Drilling mud is used to _____the cutting which are generated at the bottom of the hole. This process is also referred to as the _____. (C.O.No.1) [Knowledge]
4. Symptoms of poor hole cleaning are Excessive torque & drag on connections, _____ and _____. (C.O.No.1) [Knowledge]
5. Write **TRUE/FALSE** for the following sentence,
(a) Oil- and synthetic-based mud generally lubricate better than water-based mud but the latter can be improved by the addition of lubricants
(b) Poor lubrication causes high torque and drag (C.O.No.1) [Knowledge]
6. Write the temperature range for Extreme and Ultra HPHT well. (C.O.No.2) [Knowledge]
7. Define API. What is the particle size for Colloid as per API? (C.O.No.2) [Knowledge]
8. Write two examples of Pneumatic based Drilling fluid. (C.O.No.2) [Knowledge]
9. What is Unit cell and Crystal lattice? (C.O.No.2) [Knowledge]

10. The clay in its dry state has platelets stacked in face-to-face association, like a deck of cards, this is _____. When agitation is stopped, clay platelets will be mutually attracted in *edge-to-edge or edge-to-face association*. This forces a structure similar to a house of cards, termed _____.
(C.O.No.2) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries FOUR mark. (4Qx4M=16M)

11. "A Water based Drilling fluid composed of four component-continuous phase, reactive phase, inert phase & additives."-Are these important? If Yes, how? (C.O.No.2) [Comprehension]

12. Mention one problem if the drilling fluid failed to serve the following purpose,

- (a) Cooling the bit
- (b) Counter balance formation pressure
- (c) Lubricate Drill string
- (d) Cutting lifting (C.O.No.2) [Comprehension]

13. "Form a thin, low permeability filter cake which seal pores and other openings in formation penetrated by the bit"-Discuss the process of mud cake formation with 4 relevant points.
(C.O.No.1) [Comprehension]

14. "Pneumatic drilling fluid (or gas-based mud; air-based mud) is used to drill in areas where the use of conventional drilling fluids is not feasible"-Write any four characteristics of Pneumatic drilling fluid.
(C.O.No.1) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. The question carries FOURTEEN mark. (1Qx14M=14M)

15. A formation characteristics is given in the attached table. Let's say you have 50 bbl of 15 ppg initial mud. Also you are given Barite of Density 35.5 ppg. Now do the required manipulation and design a mud plan so that it can counter the formation pressure. Do check whether the 1st mud is suitable for Zone 1 or not. Following point should be included in the solution,

- Required mud weight based on the formation pressure should be checked well
- Amount of Barite required to get the desired mud weight in lb and Sack should be mention
- Final volume of mud after adding Barite in Zone 2 & 3 (Do note with the addition of Barite volume, the total mud also increases)

Zone	Depth	Expected Formation Pressure
	ft.	Psi
1	500	350
2	1000.00	900
3	1500.00	1250

(C.O.No. 2) [Application]



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Instructions:

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(v) Question paper consist of three parts, PART A, B & C

(vi) All questions are mandatory

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries TWO mark.

(10Qx 2M= 20M)

1. Arrange the following mud in the increasing order of harmfulness to environment.

“Synthetic mud, APHRON, Native mud, Diesel, Polymer added WBM” (C.O.No.1) [Knowledge]

2. Define COLLOID and FOAM. (C.O.No.1) [Knowledge]

3. Drilling mud is used to _____ the cutting which are generated at the bottom of the hole. This process is also referred to as the _____. (C.O.No.1) [Knowledge]

4. Symptoms of poor hole cleaning are Excessive torque & drag on connections, _____ and _____. (C.O.No.1) [Knowledge]

5. Write **TRUE/FALSE** for the following sentence,

(a) Oil- and synthetic-based mud generally lubricate better than water-based mud but the latter can be improved by the addition of lubricants

(b) Poor lubrication causes high torque and drag (C.O.No.1) [Knowledge]

6. Write the temperature range for Extreme and Ultra HPHT well. (C.O.No.2) [Knowledge]

7. Define API. What is the particle size for Colloid as per API? (C.O.No.2) [Knowledge]

8. Write two examples of Pneumatic based Drilling fluid. (C.O.No.2) [Knowledge]

9. What is Unit cell and Crystal lattice? (C.O.No.2) [Knowledge]

10. The clay in its dry state has platelets stacked in face-to-face association, like a deck of cards, this is _____. When agitation is stopped, clay platelets will be mutually attracted in *edge-to-edge or edge-to-face association*. This forces a structure similar to a house of cards, termed _____.
(C.O.No.2) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries FOUR mark. (4Qx4M=16M)

11. "A Water based Drilling fluid composed of four component-continuous phase, reactive phase, inert phase & additives."-Are these important? If Yes, how? (C.O.No.2) [Comprehension]

12. Mention one problem if the drilling fluid failed to serve the following purpose,

- (a) Cooling the bit
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13. "Form a thin, low permeability filter cake which seal pores and other openings in formation penetrated by the bit"-Discuss the process of mud cake formation with 4 relevant points.

(C.O.No.1) [Comprehension]

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Part C [Problem Solving Questions]

Answer all the Questions. The question carries FOURTEEN mark. (1Qx14M=14M)

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Zone	Depth	Expected Formation Pressure
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1	500	350
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(C.O.No. 2) [Application]



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SCHOOL OF ENGINEERING

END TERM EXAMINATION

Winter Semester: 2021 - 22

Course Code: PET 2001

Course Name: Drilling Fluid Technology

Program & Sem: B.Tech (PET) & II Sem

Date: 7th July 2022

Time: 01.00 PM to 04.00 PM

Max Marks: 100

Weightage: 50%

Instructions:

(i) *Read the all questions carefully and answer accordingly.*

(ii) *All questions are mandatory*

Part A [Memory Recall Questions]

Answer the Question. Each question carries THREE marks.

(10Qx 3M= 30M)

1. Answer the following question

I. Name any three PSU's involve with O&G industry.

II. Define Overbalance, Underbalance and Counter balance well bore condition.

III. What is KICK and BLOW OUT? Which equipment is used to prevent blow out?

IV. Write any three symptoms of poor hole cleaning.

V. What are Mud Thickeners and Mud Thinners? Give one example of each.

VI. Define weighted mud. Why we replace Hydrocyclone with Mud cleaner for weighted mud in the mud circulatory system?

VII. Mention the units of the following: Yield Point, Gel Strength and Plastic Viscosity

VIII. What are the three components of Mud Circulatory system? Write their functions as well.

IX. Write the three sub classification of Aqueous based mud.

X. Draw Hoffman's structure. Also, define Unit cell and Crystal.

(C.O.No. 1, 2, 3, 4, 5) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks.

(4Qx10M=40M)

2. Discuss the Fig 1 with reference to different layers form around a clay particle.

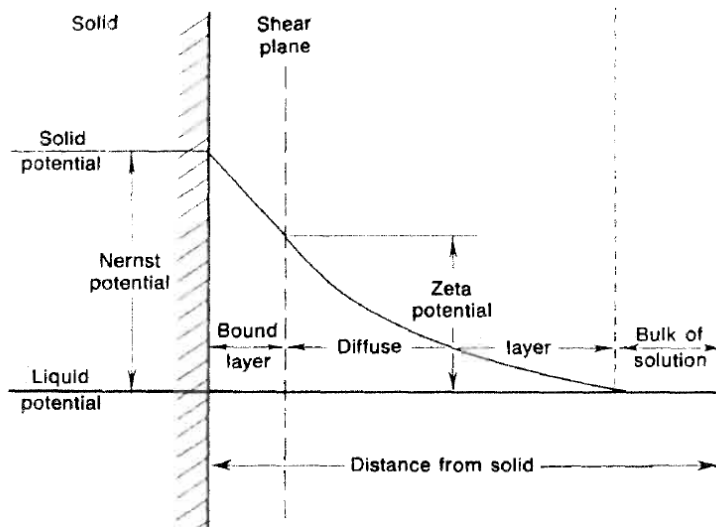


Fig 1

(C.O.No. 2) [Comprehension]

3. We all know that drilling fluid or mud has several important functions helping us achieve goal to drill well. Discuss any five of these functions with three relevant point for every function.

(C.O.No. 3) [Comprehension]

4. The drilling fluid circulating system is like a close loop electric circuit through which drilling fluid (i.e. mud) can travel from the surface to all the way downhole and back to its initial point (i.e. mud pit). Draw a neat and clear block diagram of the entire mud circulatory system, identify all its components and write one function of every components.

(C.O.No. 4) [Comprehension]

5. World Oil's annual classification of fluid systems lists nine distinct categories of drilling fluids, including: Water based system, Oil- or synthetic-based systems, Pneumatic (air, mist, foam, gas) "fluid" systems. Make a comparative study of all three types of muds and discuss its advantages and disadvantages. Make three columns are do the compression.

(C.O.No. 5) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries TEN marks.

(3Qx10M=30M)

6. It is required to reduce mud weight from 25.1 ppg to 22.6 ppg in order to combat a lost circulation problem. Calculate the volumes of water and oil required to bring about this reduction. Also, if oil is used, what is the percentage of oil in mud if the initial volume of mud is 629 bbl? The density of oil is 6.87 ppg.

(C.O.No. 3) [Application]

7. A drilling engineer wants to prepare a drilling mud of volume of 4,450 cubic feet using water and Bentonite of 2.43 gm/cc density. The required final weight was calculated to be 9.4 ppg. Calculate the amount of Bentonite to be mixed in tons and the volume of water to be used in barrels.

[1 ton=2204.62262185 pounds (lbs); 1cf=0.178 bbl]

(C.O.No. 4) [Application]

8. It is required to reduce mud weight from 25.1 ppg to 22.6 ppg in order to combat a lost circulation problem. Calculate the volumes of water and oil required to bring about this reduction. Also, if oil is used, what is the percentage of oil in mud if the initial volume of mud is 629 bbl (100 m3). The density of oil is 6.87 ppg.

(C.O.No. 5) [Application]