Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 07-10-2025 **Time:** 11.45am to 01.15pm

School: SOE	**Program:** B.Tech. (PET)	
Course Code : PET2103	**Course Name:** Drilling Fluids and Cements	
Semester: III	**Max Marks**: 50	**Weightage**: 25%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**24**	**26**	**-**	**-**	**-**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **5Q x 2M=10M**

1	Identify the failure mode of drilling fluid when exposed to >200°C and >15,000 psi conditions without thermal stabilizers.	**2 Marks**	**L1**	**CO1**
2	State the selection of synthetic-based mud in HPHT drilling despite higher costs and environmental restrictions.	**2 Marks**	**L1**	**CO1**
3	Relate the concept of zeta potential into practical drilling fluid implication.	**2 Marks**	**L1**	**CO2**
4	Describe the effect of zeta potential on colloidal stability.	**2 Marks**	**L1**	**CO2**
5	Outline the importance of particle association (flocculation / deflocculation) in mud rheology.	**2 Marks**	**L1**	**CO2**

Part B

Answer the Questions. **Total Marks 40M**

6.	**a.**	Describe in detail the primary and secondary functions of drilling fluids. Summarize how do these functions become more critical in HPHT wells compared to conventional wells. Support your answer with examples.	**14 Marks**	**L2**	**CO1**
	b.	Identify and explain at least three common failure mechanisms of drilling fluids in HPHT wells.	**06 Marks**	**L2**	**CO1**
		Or			
7.	**a.**	Compare water-based muds, oil-based muds, and synthetic-based muds in terms of: (i) Environmental impact (ii) Thermal/chemical stability (iii) Cost-effectiveness (iv) HPHT applicability Finally, defend your recommendation for the most suitable system for drilling ultra-deep HPHT wells, giving technical justification.	**10 Marks**	**L2**	**CO1**
	b.	Explain the role of drilling fluids in maintaining wellbore stability. Discuss how mud weight, rheology, and fluid loss properties interact to prevent problems such as sloughing shales, differential sticking, and borehole collapse.	**10 Marks**	**L2**	**CO1**

8.	**a.**	A drilling mud having a density of 12.0 ppg is prepared using fresh water and clay of specific gravity 3.0. Determine the volume percent and weight percent of clay present in the mud.	**10 Marks**	**L3**	**CO2**
	b.	A total of 1,750 bbl of drilling mud is required at the rig site. The available mud in the system has a density of 10.2 ppg, but the target mud weight is 10.5 ppg. To achieve this, clay with a density of 2.52 g/cc will be added. Determine the volume of the existing mud that should be used and the quantity of clay (in tons) that must be mixed to prepare the desired final mud	**10 Marks**	**L3**	**CO2**
		Or			
9.	**a.**	A well is drilled to a depth of 10,500 ft. The top of the oil formation is at 8600 ft and the bottom is at 9,500 ft. The pore pressure at 8,600 ft is 4,600 psi. a. Calculate the mud weight in pcf to balance the pore pressure at 8,600 ft. b. Determine the mud weight to be used to overbalance the pore pressure by 500 psi. c. Predict the overbalance pressure if 13.6 ppg mud is used.	**10 Marks**	**L3**	**CO2**

		d. If the fracture gradient of the formation at 8,600 ft is 0.85 psi/ft, then determine the bottom hole pressure that will fracture the formation.			
	b.	A surface section of 2,000 ft and 17.5 diameter has to be drilled using 9.2 ppg mud. The mud will be prepared using fresh water and attapulgite that has a density of 2.9 gm/cc. If the plan is to have mud volume greater than the section volume by 1.3, calculate the volume of water in barrels and the weight of attapulgite in tons to prepare the above mud.	**10 Marks**	**L3**	**CO2**