Roll No.												

PRESIDENCY UNIVERSITY
BENGALURU

School of Engineering

Mid - Term Examinations - November 2024

Semester: III
Date: 07/11/2024
Course Code: PET3002
Time: 09:30am – 11:00am
Course Name: Directional Drilling Technology
Max Marks: 50
Program: B.Tech. (Petroleum)
Weightage: 25%

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. **2Mx5Q=10M**

1	Define KOP. State the unit of BUR.	**2 Marks**	**L1**	**CO1**
2	Define Longitude and Latitude. Why we express them in angles?	**2 Marks**	**L1**	**CO1**
3	Describe Whipstock. Differentiate between two types of Whipstock available in O&G industry	**2 Marks**	**L1**	**CO1**
4	State any two reason for selection of Bent sub as a deflection tool over Whipstock and Jet Deflection bit.	**2 Marks**	**L1**	**CO2**
5	Explain the meaning of "Dog-leg" in directional drilling. How it can be minimized?	**2 Marks**	**L1**	**CO2**

Part B

Answer ALL Questions. Each question carries 10 marks. **4QX10M=40M**

6	Directional wells introduce a unique set of challenges beyond the typical issues faced in vertical drilling. These challenges arise from factors like the well's complex profile and the diminished influence of gravity along the borehole's axis. Yet, despite these added complications, the industry continually opts for directional drilling. What compels us to pursue this technique? Discuss any five compelling reasons why directional drilling is preferred over vertical drilling, accompanied by relevant diagrams to illustrate these advantages**.**	**10 Marks**	**L2**	**CO1**

Or

7	In wellbore operations, various deflection tools are used to change the trajectory of the wellbore. Discuss how whipstocks function as deflection tools and the challenges they present in comparison to other methods. Identify three advantages of using jet deflection techniques over whipstocks in directional drilling applications.	**10 Marks**	**L2**	**CO1**
8	Explain the different types of directional well profiles along with their key features. Provide a detailed diagram for each profile, ensuring proper labeling to illustrate the distinct characteristics of each well path.	**10 Marks**	**L2**	**CO1**

Or

9	In drilling a Type II directional well profile, how do the fulcrum, stabilization, and pendulum principles interact to influence the trajectory and stability of the wellbore, and what challenges do these principles present when navigating complex geological formations? Additionally, what innovative strategies could be employed to optimize these principles in real-time drilling operations to enhance efficiency and safety?	**10 Marks**	**L2**	**CO1**
10	Examine the various types of horizontal well profiles, highlighting their distinct characteristics and suitability for different drilling environments. Furthermore, discuss the critical specifications that should be evaluated when choosing a horizontal well profile for a specific project, considering factors such as target depth, geological conditions, and production objectives	**10 Marks**	**L2**	**CO2**

Or

11	Describe the operating principle of downhole motors and discuss their advantages in drilling operations.	**10 Marks**	**L2**	**CO2**
12	You are tasked with drilling a directional well from an offshore platform to intersect a target that is located 15,000 ft horizontally from the platform. The well will follow a Type I profile (build and hold) with a kick-off point (KOP) established at 1,000 ft. The build-up rate is set at 6° per 400 ft, and the hold section will extend 10,000 ft. Calculate the inclination at the end of the build section. Determine the exact coordinates where the build section concludes. Identify the precise location of the target. To support your calculations, draw a detailed diagram that illustrates the horizontal distance (HD), total vertical depth (TVD), and measured depth (MD) of the wellbore, ensuring all measurements and relationships are clearly represented.	**10 Marks**	**L3**	**CO2**

Or

13 A Type-I directional well is being drilled from location A (30 ft. N, 50 ft. E) to location T (8,000 ft. S, 4,000 ft. W). The horizontal departure to the target is 10,000 ft. The radius of curvature for the buildup section is 5,000 ft. The well is building an angle from the kick-off point (KOP) and ends at point C. The horizontal displacement and measured depth at point C are 3,000 ft. and 7,500 ft. respectively. **10 Marks** **L3** **CO2**

Based on the above conditions, draw a geometric profile of the wellbore and state the exact location of points C and T in terms of measured depth (MD), horizontal distance (HD), and total vertical depth (TVD). Additionally, determine and include the angle of inclination at point C along with the build-up rate. Ensure to indicate the KOP value in the diagram.