

Roll No



**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING END
TERM EXAMINATION - JUN 2023**

Semester : Semester II - 2022

Course Code : PET2003

Course Name : Sem II - PET2003 - Fundamental of Oil and Gas Well Drilling
Technology

Program : PET

Date : 23-JUN-2023

Time : 1.00PM

-4.00PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS

(10 X 3 = 30M)

1. Write the relationship between
 - a. Journal angle and Cone size
 - b. Hardness of the formation and Cone offset
 - c. Hardness of the formation and Journal angle(CO3) [Knowledge]
2. State any three features of Natural Diamond bit. (CO3) [Knowledge]
3. Write the uses of the following: (a) Reamer (b) K-Monel Drill collar (c) Stabilizer (CO4) [Knowledge]
4. Mention the role of "Kelly Accessories" in drilling. (CO4) [Knowledge]
5. Why will you select BIT-2 over BIT-1 to drill a hard formation?
BIT-1: Cone Offset 3, Journal Angle 25 degree
BIT-2: Cone Offset 0, Journal Angle 45 degree (CO3) [Knowledge]
6. What is liner? Mention one advantage and disadvantage of liner. (CO4) [Knowledge]
7. Draw all three PDC Bit profiles. (CO3) [Knowledge]
8. Identify the "Class" of Drill Pipe
 - (a) a) Pipe having a uniform wear and a minimum wall thickness of
 - (b) b) Pipe having a minimum wall thickness of 65% with all wear on one s
 - (c) c) Pipe having a minimum wall thickness of 55% with all wear on one s(CO4) [Knowledge]

9. The main function of drill pipe is to transmit rotary motion and drilling mud under high pressure to the drill bit. The drill pipe is subjected to several types of loading, including
 (a) Axial loading due to _____, (b) Radial forces due to _____, (c) Torque due to _____.
 (CO4) [Knowledge]
10. Match Set-1 with Set-2
Set-1: (A) Roller Cone; (B) PDC; (C) Natural Diamond
Set-2: (a) Shearing; (b) Ploughing (c) Crushing
 (CO3) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

(2 X 15 = 30M)

11. "Casing is a large diameter pipe that is assembled and inserted into a recently drilled section of a borehole. Similar to the bones of a spine protecting the spinal cord, casing is set inside the drilled borehole to protect and support the well stream"-Discuss briefly the objectives of running casing string along with its types
 (CO1) [Comprehension]
12. Explain the following statements with relevant diagrams (**should be drawn with pencil**).
 (i) "The cone size decreases as the journal angle increases from 0° to 45°."
 (ii) "Journal angle and oversize angles are inversely proportional to each other"
 (iii) "The angle made by the cone axis with the horizontal plane is equivalent with the Journal angle"
 (CO2) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

(2 X 20 = 40M)

13. Rock samples were collected from 6 different depth and given it for testing of its compressive strength and morphology study. Results obtained are listed in Table-1. A standard formation classification is also listed below. Based on the information given, complete the table with the most appropriate drill bit with their features.
 Table-1

Classification	Compressive Strength
Very Low Strength	<4000
Low Strength	4,000-8,000
Medium Strength	8,000-16,000
High Strength	16,000-32,000
Very High Strength	>32,000

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7	COLUMN 8	COLUMN 9
DEPTH (ft.)	Compressive strength (Psi)	IADC Nomenclature	JOURNAL ANGLE (In Degree)	CONE OFFSET (Skew angle)	CUTTER SIZE (LONG/SHORT/MEDIUM)	TOOTH SPACING (WIDELY SPACED/CLOSELY SPACED)	PENETRATION RATE (HIGH/LOW/MEDIUM)	CLEANING FLOW REQUIREMENT (HIGH/MEDIUM/LOW)
Upto 500 meter	5000							
500 to 1200 meter	2654							
1200 to 1865 meter	4500							
1865 to 2200 meter	33000							
2200 to 2500 meter	20000							
2500 to 2870 meter	7000							

(CO3) [Application]

14. An exploration rig has the following grades of drill pipe to be run in a 15000 ft. deep well. Grade E: 5" x4.276"; 19.5 ppf
Grade G: 5" x4.276"; 19.5 ppf
If the total length and weight of drill collar plus heavy wall drill pipe is 984 ft. and 157347 lb, respectively, check the (a) the maximum length that can be used from each grade of drill pipe if an MOP of 50000 lb is to be maintained for the lower grade and (b) the MOP of the heavier grade. Consider the maximum expected mud weight @15000 ft. 100 pcf
P.S.: The lighter grade should be used for the bottom part while the higher grade should be used at the topmost section

(CO4) [Application]