



**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
MID TERM EXAMINATION - APR 2023**

Semester : Semester IV & VI

Course Code : PET3002

Course Name : Sem IV & VI - PET3002 - Directional Drilling Technology

Program : PET

Date : 15-APR-2023

Time : 9.30AM - 11.00AM

Max Marks : 60

Weightage : 30%

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

(5 X 2 = 10M)

1. Earth's shape is _____. Fill up the blank. Also mention why it is like that.
(CO1) [Knowledge]
2. Bent Sub plays a very vital role while initiating deviation in directional well. Write why?
(CO1) [Knowledge]
3. State the Horizontal Displacement range for Medium radius horizontal well and short radius horizontal well.
(CO1) [Knowledge]
4. State any two reason for selection of Bent sub as a deflection tool over Whipstock and Jet Deflection bit.
(CO2) [Knowledge]
5. Find the location (in terms of hemisphere) of the following points (i) 20°N 120°W (ii) 85°S 0°W (iii) 37°45'37"S 150°54'60"E (iv) 0°N 145°0'25"E
(CO2) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

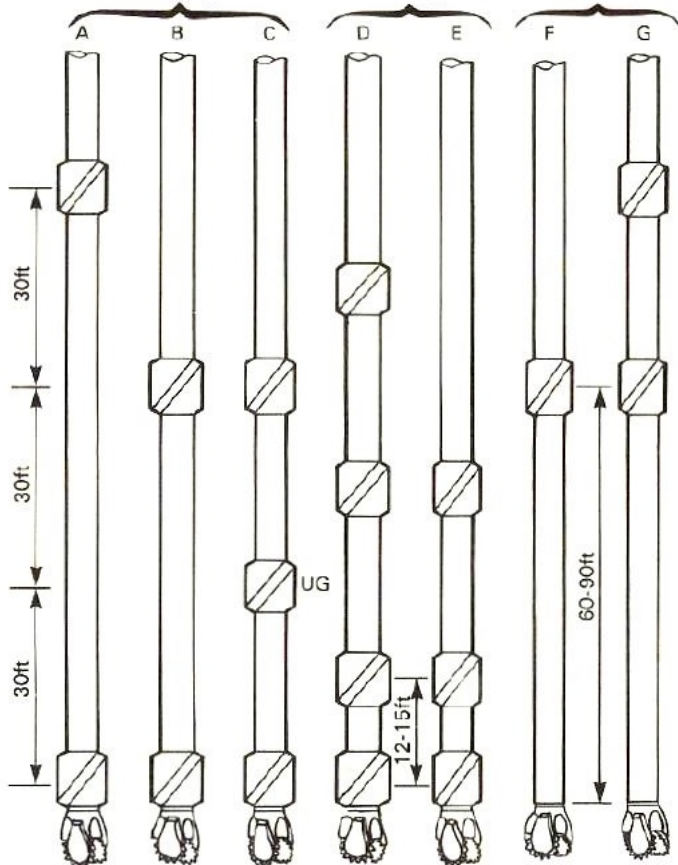
(3 X 10 = 30M)

6. With the advent of steerable systems, some directional wells are planned and drilled with complex profile types involving 3-dimensional turns. Generally, this happens mainly in the case of re-drills, where old wells are sidetracked and drilled to entirely new targets. However, these complex well paths are harder to drill, and the old adage that "the simplest method is usually the best" holds true. Therefore, most directional wells are still planned using the traditional patterns which have been in use for many years. Highlight the differences in the approach while drilling these traditional patterns with all advantages and disadvantages. Draw these patterns along with proper labeling.
(CO1) [Comprehension]

7. In a deviated well, to add WOB available BHAs are B 8" × 3" drill collars and 8"×5", 19.5 lb/ft. Discuss the effects of bending for both the drill collars configuration, and suggest an alternative to reduce bending. You can assume both Drill Collar are made up of steel with $E = 29 \times 10^6$ psi.

(CO2) [Comprehension]

8. Identify the following rotary BHA (A, B, C, D, E, F, G). As we can see from the figure, placement of stabilizers are different for all BHA. Discussed how the placement of stabilizers influence the well path in a directional well with the mention of the principle followed for each BHA.



(CO2) [Comprehension]

PART C

ANSWER THE FOLLOWING QUESTION

(1 X 20 = 20M)

9. A directional well is to be drilled from an offshore platform to intersect a target whose TVD is 5500 ft. at a depth of 10,500 ft. (TVD). A Type I profile (build and hold) is to be used with a KOP = 1600 ft. and a build-up rate of 1.5° per 100 ft. With the help of geometric and mathematical interpretation decide and show with a diagram the inclination at the end of the build section; the exact location of the end of build-up section as well as the target. Your diagrammatic representation must contain HD, TVD and MD.

(CO2) [Application]