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**PRESIDENCY UNIVERSITY
BENGALURU**

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

Semester : Semester VI - 2020

Course Code : PET3002

Course Name : Sem VI - PET3002 - Directional Drilling Technology

Program : PET

Date : 14-JUN-2023

Time : 9.30AM - 12.30PM

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.
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PART A

ANSWER ALL THE QUESTIONS

(10 X 3 = 30M)

1. Fill up the blanks
 - (a) Dump valve ports must be _____ during drilling to allow normal flow through the motor (Open/Close)
 - (b) PDM is more efficient with _____ mud. (OBM/WBM)
 - (c) Stator of PDM is made up of _____. (Steel/Elastomer)

(CO3) [Knowledge]
2. Identify the fishing tool:
 - (a) "A" is an outside catch, a positive engagement and disengage able tool.
 - (b) "B" is the simplest fishing tools available for engaging a fish externally. This is not a positive engagement tool
 - (c) "C" insure positive engagement, easy release from the fish when desired and easy re-engagement. It is ruggedly built to withstand severe jarring and pulling strains. It engages the fish over a large area without damage or distortion of the fish.

(CO3) [Knowledge]
3. What made "Acid Bottle" survey tool a failure as a directional survey tool?

(CO4) [Knowledge]
4. "We can't avoid "Directional Survey"-Mention why with three relevant points.

(CO4) [Knowledge]
5. Mention any one advantage and two disadvantage of "Dia-collar".

(CO3) [Knowledge]

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| 6. "PDM vs Turbine Motor"-Write three points on this. | (CO4) [Knowledge] |
| 7. State the principle of "Acid bottle" survey tool with a diagram. | (CO4) [Knowledge] |
| 8. Write how we obtained "Positive Pulse" and "Negative Pulse" in MWD. | (CO3) [Knowledge] |
| 9. Draw all three graph for "Mud Telemetry" system of MWD. | (CO3) [Knowledge] |
| 10. What is "Fishing"? What is the best fishing technique? | (CO4) [Knowledge] |

PART B

ANSWER ALL THE QUESTIONS

(2 X 15 = 30M)

11. Answer briefly,
- (a) Explain how the tendency for a bottom hole assembly to build or drop angle can be affected by changing the position of the lowermost stabilizer.
- (b) The Drill string becomes stuck while drilling a directional well. The driller reports that he can still circulate, but can't rotate or reciprocate the pipe. Now,
- (i) What is the most likely cause of the stuck pipe?
- (ii) What action should the driller take to free the pipe? (CO1) [Comprehension]
12. "In well planning, the key to achieving objectives successfully is to design drilling programs on the basis of anticipation of potential hole problems rather than on caution and containment"-Briefly elaborate these potential hole problems with suitable diagrams. (CO2) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

(2 X 20 = 40M)

13. Read the case let thoroughly and do as directed.
- An ABC well at CAUVERY ONLAND BASIN was drilled upto target depth of 4200m; while drilled at a depth of 3188m driller starts to encounter some complications. At the depth of 3188 m the previous casing shoe is 12". Before encountering an abnormal pressure formation, to add extra safety the driller decided to replace the RAM BOP and in the process an API 20E specification bolt fell into the wellbore. The Drill string was *Pull-Out-Of-Hole (POOH)*. As the formation is abnormal, driller decided to add extra mud weight while fishing. POOH, 2 stands of DP is recovered but string was sheared vertically and at a depth of 1500m. From the recovered portion it was observed that the pipe sheared at X/O sub. A fishing tool "Tool-1" is *Run-In-Hole (RIH)* with 9 5/8" guide to *Fish Top (FT)* (1500m) which engaged fish. While POOH was tried it was observed that the fish is rotating but it was unable to pull up and disengage. Let's assume you have applied a remedial measure "Job-1" to free the pipe then retrieve the fish with "Tool-2", but complication doesn't end there. During POOH, found all three cones left in the well. RIH RCJB, but no results. Next available option is "Tool-3". RIH Tool-3. Successfully retrieve all junks from the wellbore.
- (a) Based on the above information select the most appropriate fishing tool to recover all fishes from the wellbore.
- (b) Discuss why th Tool-1" failed to recover the fish.
- (c) After freeing the string the driller could use "Tool-1" instead he/she choose "Tool-2". Why?
- (d) Discuss in details about Job-1".
- (e) Give some mitigation/precautions to avoid the above mention complicatio (CO4) [Application]
14. Given that a well is drilling from location X (2ft. S 7ft. W) till target location Y (6000ft. S 4500 ft. W). The TVD upto target is 16500 ft. The wellbore trajectory starts to deviate from vertical position @ 1315 ft. with a BUR of 12°/30ft. This angle building at Point Z with an inclination angle of 30°. Based on the above condition draw a Geometric profile and also state the exact location of the point C and T in terms of MD, HD and TVD. (CO3) [Application]