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PRESIDENCY UNIVERSITY BENGALURU

 SCHOOL OF ENGINEERING

 SUMMER END END SEMESTER EXAMINATION - AUGUST 2024

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| **Semester: Summer End Semester Exam** | **Date: 06-08-2024** |
| **Course Code: PET3004** | **Time: 1;00PM-4:00PM** |
| **Course Name: Advanced Well Engineering** | **Max Marks: 100** |
| **Program: B. Tech.**  | **Weightage: 50%** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *The question paper consists of 3 parts.*
3. *Scientific and non-programmable calculators are permitted.*
4. *Do not write any information on the question paper besides Roll Number.*
5. *Use Graph Paper wherever needed. Write the Question No. on the graph paper with a pen.*

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| **PART A** |
|  **ANSWER ANY 5 QUESTIONS 5Q X 2M=10M** |
| 1 | Define PDC in the context of drilling. | (CO 1) | [Knowledge] |
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| 2 | State the significance of mud weight in drilling. | (CO 1) | [Knowledge] |
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| 3 | Clarify the concept of trip margin. | (CO 2) | [Knowledge] |
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| 4 | State the role of a mud motor in drilling. | (CO 3) | [Knowledge] |
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| 5 | Define lost circulation. | (CO 3) | [Knowledge] |
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| 6 | Narrate wellbore stability. | (CO 4) | [Knowledge] |
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| 7 | Identify the primary goal of directional drilling. | (CO 4) | [Knowledge] |
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| **PART B** |
|  **ANSWER ANY 5 QUESTIONS 5Q X 10M=50M** |
| 8 | 1. Calculate the hydrostatic pressure exerted by a mud column 10,000 feet deep with a density of 12.5 ppg.
2. Calculate the required mud weight to balance formation pressure of 4,200 psi at 8,000 feet TVD.

**5+5=10** | (CO 1) | [Comprehension] |
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| 9 | 1. Calculate the volumetric flow rate required to maintain an annular velocity of 120 feet/minute in a 12.25-inch hole with a 5.5-inch drill pipe.
2. Calculate the tensile load on a drill string suspended in a vertical well with a total length of 15,000 feet and a weight of 20 lbs/ft.

**5+5=10** | (CO 1) | [Comprehension] |
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| 10 | 1. Calculate the pressure drop across a bit with a flow rate of 500 gallons per minute (GPM) and a nozzle area of 0.2 square inches.
2. Calculate the equivalent circulating density (ECD) at 10,000 feet with a mud weight of 14.0 ppg and a pressure loss of 500 psi.

**5+5=10** | (CO 2) | [Comprehension] |
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| 11 | 1. Briefly describe the significance of drill stem testing (DST) in reservoir evaluation.
2. State the process of well control and its key components.

**5+5=10** | (CO 2) | [Comprehension] |
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| 12 | Draw a neat sketch of a Wellhead. Describe the main components of a Wellhead and their functions. | (CO 2) | [Comprehension] |
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| 13 | Discuss the principles and benefits of underbalanced drilling (UBD). | (CO 3) | [Comprehension] |
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| 14 | Describe the mechanisms of torque and drag in drilling operations. | (CO 3) | [Comprehension] |
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| **PART C** |
|  **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** |
| 15 | Discuss the comprehensive design considerations for a drilling fluid program, including properties, functions, and types of drilling fluids. Include a calculation for determining the minimum mud weight needed to balance a formation pressure of 5,000 psi at 12,000 feet TVD. | (CO 3) | [Application] |
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| 16 | Evaluate the principles and challenges of deepwater drilling operations, including equipment requirements, environmental considerations, and risk management. Include a calculation for determining the riser tension required to support a drilling riser with given parameters. | (CO 3) | [Application] |
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| 17 | Discuss the application and benefits of rotary steerable systems (RSS) in directional drilling. Include a calculation for determining the dogleg severity (DLS) given a change in inclination and azimuth over a measured depth. | (CO 4) | [Application] |
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