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PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF ENGINEERING

MAKE UP EXAMINATION – JULY 2024

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| **Semester : VI** | **Date : 01-07-2024** |
| **Course Code : PET2024** | **Time :1:30 PM-4:30 PM** |
| **Course Name : Wellbore Problems and Mitigations** | **Max Marks : 100** |
| **Program: B.Tech. in Petroleum Engineering** | **Weightage : 50%** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

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| **PART A** | | | |
| **ANSWER ANY 5 QUESTIONS 5Q X 2M=10M** | | | |
| 1 | Define Down hole problems. State the name of anyone. | (CO 1) | [Knowledge] |
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| 2 | State the lost circulation | (CO 2) | [Knowledge] |
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| 3 | Describe differential sticking. | (CO 1) | [Knowledge] |
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| 4 | Define Kick Tolerance. | (CO 4) | [Knowledge] |
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| 5 | State Boyle's Law and write down its mathematical expression. | (CO 4) | [Knowledge] |
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| 6 | Describe Abnormal Pressure. | (CO 3) | [Knowledge] |
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| 7 | Define Overburden pressure and write down its mathematical expression. | (CO 3) | [Knowledge] |
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| **PART B** | | | |
| **ANSWER ANY 5 QUESTIONS 5Q X 10M=50M** | | | |
| 8 | Tectonic activity can lead to the formation of abnormal pore pressure through various mechanisms, such as salt diapirism, folding, faulting, and uplift. Elucidate the statement. | (CO 3) | [Comprehension] |
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| 9 | The provided figure shows the response of shale interval time with respect to depth. A deviation from the normal trend line is clearly identifiable. Identify the type of logging used to obtain this trend. As a drilling engineer, based on this data point, state the type of pressure that exists at point "A." Explain your answer with proper reasoning for the type of pressure existing at point "A." | (CO 1) | [Comprehension] |
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| 10 | Pipe sticking is caused due to formation related issues which includes Unconsolidated formation, Fractured formation, Reactive formation, Mobile formations and geopressured formation. Justify the statement. | (CO 1) | [Comprehension] |
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| 11 | In the provided figure, a gas has entered an open tube, and the stages of its travel through the mud are depicted. Key parameters at the gas entry point and when it reaches the tube's top are specified. Estimate the volume change of the gas upon reaching the surface. | (CO 4) | [Comprehension] |
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| 12 | Doglegging represents a significant challenge in drilling operations, impacting efficiency, costs, and safety. Elucidate the statement. | (CO 1) | [Comprehension] |
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| 13 | Understanding the causes of mud losses—whether natural formations, induced fractures, or excessive overbalance—allows drilling engineers to implement effective strategies to mitigate these issues. Justify the statement. | (CO 2) | [Comprehension] |
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| 14 | The RFT (Repeat Formation Tester) is a wireline run tool designed to measure formation pressures and to obtain fluid samples from permeable formations. Explain the statement with respect to calculation of abnormal pressure along with limitations of this technique. | (CO 4) | [Comprehension] |
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| **PART C** | | | |
| **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** | | | |
| 14 | Given that  Intermediate casing = 9.625 in set at 10,400 ft  Casing ID = 8.765 in  Drillpipe = 5/4.276 in, 11,400 ft  Drillcollars = 6/3 in, 600 ft  During drilling of a hole at 12000 ft, a complete loss of circulation was observed. Drilling was stopped and the mud level in the annulus was observed to fall rapidly. The well was filled with water of 8.3 ppg density until the annular level remained stationary. If the volume of water used was 110 bbl and mud density was 12.7 ppg.  Determine:  (1) The formation pressure at 12,000 ft, if the annulus level remains static.  2) The equivalent density in the annulus and the density of mud required to balance the formation.  3) The hydrostatic pressure at the casing seat after designing the new mud. | (CO 2) | [Application] |
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| 15 | As following parameters are given for a well:  9 5/8" casing =14,500 ft; Next TD = 17000 ft; Fracture Gradient (FG) at 9 5/8" shoe = 16 ppg; Temperature gradient = 0.02 F°/ft; Max. Mud weight for next hole =14.5 ppg; Max formation pressure at next hole= 14 ppg; Assume next hole 8 ½" and there is 5" drillpipe from surface to TD. Also assume gas pressure gradient (G) = 0.1 psi/ft; Surface Temperature = 60 F°. Calculate   1. Volume of the kick fluid at casing shoe. 2. Kick tolerance volume without considering the temperature gradient. 3. Kick tolerance volume with considering temperature gradient. 4. Comment on the values of kick tolerance volume (i.e., with and without considering temperature) | (CO 4) | [Application] |
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| 16 | Determine the overburden gradient at various depths for the following offshore well: Water Depth= 500 ft; RKB/MSL (Kelley Bushing or drilling floor/Mean Sea level) = 65 ft; Specific gravity of sea water= 1.03 gm/cc; Rock density= 1.9 gm/cc from seabed to 1000 ft, and 2.1gm/cc from 1000-3000 ft. Calculate the overburden gradient of the formations: 500 ft, 1000 ft and at 3000 ft below seabed. | (CO 3) | [Application] |
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