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PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF ENGINEERING

Summer term EXAMINATION - August 2024

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| **Semester : Summer** | **Date : 05.08.2024** |
| **Course Code : PET2010** | **Time : 9.30AM -12.30PM** |
| **Course Name : Introduction to Oil and Gas Reservoir Simulation** | **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 | Write the significance of reservoir simulation in the oil and gas industry. | (CO 1) | [Knowledge] |
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| 2 | Define Material Balance Equation. | (CO 1) | [Knowledge] |
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| 3 | List the Chemical Simulator's advantages. | (CO 1) | [Knowledge] |
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| 4 | State the application of Equation of state. | (CO 1) | [Knowledge] |
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| 5 | State the features of compositional simulator (STARS). | (CO 1) | [Knowledge] |
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| 6 | Define CBM reservoir. | (CO 1) | [Knowledge] |
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| 7 | Describe the role of Minimum Miscibility Pressure in enhanced oil recovery. | (CO 1) | [Knowledge] |
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| **PART B** | | | |
| **ANSWER ANY 5 QUESTIONS 5Q X 10M=50M** | | | |
| 8 | Explain in detail the benefits, drawbacks, and procedural stages associated with employing reservoir simulation in the oil and gas industry. | (CO 1) | [Comprehension] |
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| 9 | Elucidate the basic stages of reservoir modeling and explain why using reservoir modeling methods is essential. | (CO 1) | [Comprehension] |
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| 10 | IMEX, which stands for Implicit Pressure, Explicit Saturation (IMEX), is a type of black oil simulator used in reservoir engineering for modeling fluid flow in oil reservoirs. This simulator employs implicit numerical methods for solving the pressure equation, providing stability and efficiency in handling the pressure terms. Illustrates the characteristics of the IMEX (Black Oil Simulator). | (CO 1) | [Comprehension] |
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| 11 | The general steps involved in reservoir simulation, a complex process used in reservoir engineering to model and analyze the behavior of hydrocarbon reservoirs over time. Discuss the statement in details. | (CO 1) | [Comprehension] |
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| 12 | Elaborate the significance of historical data and history matching within reservoir simulation, detailing their roles in achieving precision in depicting past occurrences and enhancing predictions for future hydrocarbon recovery in reservoir engineering. | (CO 1) | [Comprehension] |
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| 13 | It is crucial for reservoir simulation engineers to discern the distinct impacts of compositional simulation versus black oil simulation in influencing decision-making processes within the oil and gas industry, particularly in capturing intricate fluid dynamics and overcoming simplified assumptions and constraints. Give reasons why it is crucial. | (CO 1) | [Comprehension] |
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| 14 | Discuss how upscaling serves as a crucial link between detailed geological models and practical simulation processes, enabling more precise predictions of fluid flow and recovery in complex subsurface reservoirs. | (CO 1) | [Comprehension] |
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| **PART C** | | | |
| **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** | | | |
| 14 | In reservoir engineering, the Material Balance Equation (MBE) is a crucial analytical tool used to evaluate the behavior of petroleum reservoirs. It helps in estimating the amount of hydrocarbons in place and predicting how the reservoir will perform under various production conditions. Derive material balance equation. | (CO 1) | [Application] |
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| 15 | Compare and contrast the computational requirements and data needs of material balance equations and reservoir simulations. How do these differences impact their use in various stages of reservoir analysis? | (CO 1) | [Application] |
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| 16 | Reservoir simulation modeling involves creating computerized representations of subsurface reservoirs to simulate and analyze their behavior. This modeling process is crucial in the field of reservoir engineering for predicting fluid flow, estimating hydrocarbon recovery, and optimizing production strategies. Compare and contrast static and dynamic modelling with an analytical approach. | (CO 1) | [Application] |
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