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PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF ENGINEERING

END TERM EXAMINATION, SUMMER TERM - August 2024

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| **Semester: Summer Term** | **Date: 05/08/2024** |
| **Course Code: PET3003** | **Time: 9.30am-12.30 pm** |
| **Course Name: Offfshore Drilling and Petroleum Production Practices** | **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 | List three key components that are included in a Field Development Plan (FDP). | (CO4) | [Knowledge] |
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| 2 | Define the primary function of a subsea manifold in the oil and gas industry. | (CO4) | [Knowledge] |
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| 3 | State the difference between wet tree and dry tree in offshore oil and gas production. | (CO3) | [Knowledge] |
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| 4 | Define the terms Gas Conditioning and Gas Metering in processing system. | (CO4) | [Knowledge] |
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| 5 | State the principle that describes the buoyant force acting on a solid body submerged in a fluid. | (CO1) | [Knowledge] |
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| 6 | Mention the problems caused by water in gas processing and pipeline transport. | (CO4) | [Knowledge] |
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| 7 | State the importance of station keeping in offshore operations and name the different forces that act on the vessel | (CO3) | [Knowledge] |
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| **PART B** | | | |
| **ANSWER ANY 4 QUESTIONS 5Q X 10M=50M** | | | |
| 8 | Discuss the differences between conventional mooring and turret mooring systems in oil and gas operations. Explain the functionality and advantages of turret mooring systems, including its ability to allow vessels to weathervane. Also, describe the different types of turret mooring systems and their specific applications, such as moonpool turret mooring and external turret mooring. | (CO3) | [Comprehension] |
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| 9 | Demonstrate the advantages and key considerations in the selection of various offshore storage structures, including FPSOs, FSRUs, FSUs, oil storage barges, and subsea storage tanks, for storing hydrocarbons in the oil and gas industry. | (CO4) | [Comprehension] |
| 10 | Analyze the design and operational advantages of Spar platforms in offshore oil and gas production, focusing on their cylindrical structure, mooring system, and ballast. Evaluate why Spar platforms are preferred over other offshore platforms in certain scenarios. | (CO2) | [Comprehension] |
| 11 | Demonstrate the reasons for treating produced water in oil and gas operations, considering its diverse constituents and potential environmental impact. Discuss the various treatment techniques and the effectiveness of these methods in water treatment, ensuring compliance with environmental standards. | (CO4) | [Comprehension] |
| 12 | A solid cylinder 5m in diameter and 5m high is floating in water axis vertical. If the specific gravity of the material of cylinder is 0.75, find height of cylinder submerged in water. | (CO1) | [Comprehension] |
| 13 | Illustrate and explain the stability conditions for stable, unstable, and neutral equilibrium using clear diagrams depicting the positions of the metacenter and the center of gravity. | (CO1) | [Comprehension] |
| 14 | Sketch a neat and clean processing block diagram illustrating the integration of separation, treatment, and environmental compliance in offshore oil and gas production: | (CO4) | [Comprehension] |
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| **PART C** | | | |
| **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** | | | |
| 15 | Illustrate the design considerations and criteria involved in selecting and implementing spread mooring systems for offshore vessels, considering factors such as the spread mooring pattern (symmetric, asymmetric, nonsymmetric), and weather directionality. Evaluate the advantages and limitations of each spread mooring pattern. | (CO3) | [Application] |
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| 16 | Sketch a comprehensive process diagram depicting the dehydration of compressed gas. Illustrate the preferred gas dehydration method in a column with bubble cap trays and discuss the key outcomes of this process in offshore oil and gas production. | (CO4) | [Application] |
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| 17 | Explain the concept and functionality of Dynamic Positioning (DP) systems in offshore oil and gas operations. Discuss the advantages of DP over conventional mooring systems, particularly in deepwater or congested sea bottom environments. Describe the three basic elements that comprise the DP system and their respective roles. Additionally, explain how the DP system controls the horizontal plane motion of a floating vessel, detailing the degrees of freedom it manages. | (CO3) | [Application] |
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