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PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF INFORMATION SCIENCE

SUMMER END TERM EXAMINATION - August 2024

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| **Semester : SUMMER END TERM** | **Date :05.08.2024** |
| **Course Code : PET214** | **Time : 9:30AM to 12:30PM** |
| **Course Name** : Surface Production Operations | **Max Marks : 100** |
| **Program : B.Tech** | **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 role of a Heater-Treater in designing an oil and gas surface facility. | (CO1) | [Knowledge] |
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| 2 | Draw a cutaway showing a typical fire tube that heats the heating and water wash section emulsion. | (CO1) | [Knowledge] |
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| 3 | Sketch the Baffles, installed in the coalescing section, causing the emulsion to follow a back-and-forth path up through the oil setting section. | (CO1) | [Knowledge] |
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| 4 | Tabulate the disposal standards for produced water in offshore operations worldwide. | (CO2) | [Knowledge] |
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| 5 | “Separation of crude from gas is taking a minimum of 3 to 4 min" Define the statement. | (CO2) | [Knowledge] |
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| 6 | State the disposal standards for produced water in onshore operations. | (CO2) | [Knowledge] |
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| 7 | Outline the dissolved solids in the waters produced along with the oil and gas streams. | (CO2) | [Knowledge] |
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| **PART B** | | | |
| **ANSWER ANY 5 QUESTIONS 5Q X 10M=30M** | | | |
| 8 | (a) Assess the importance of crude oil desalting. (4)  (b) Draw the labeled process flow diagrams of single and 2-stage desalting systems. (3+3=6) | (CO1) | [Comprehension] |
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| 9 | (a) Sketch a labeled Horizontal Electrostatic Desalter (Heater-Treater) schematic. (6)  (b) Describe the process of desalting crude oil. (4) | (CO2) | [Comprehension] |
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| 10 | Determine the significance of using an Electrostatic Heater Treater in designing an oil and gas surface facility with a properly labeled schematic. | (CO2) | [Comprehension] |
| 11 | (a) Summarize the importance of produced water treatment in oil and gas surface facilities. (4)  (b) List the disposal standards for water produced in offshore and onshore regions. (3+3=6) | (CO3) | [Comprehension] |
| 12 | Discuss the characteristics of “Dissolved Solids” and “Precipitated Solids” obtained from the water produced during the flow of crude oil to the oil and gas surface facilities. | (CO3) | [Comprehension] |
| 13 | Design the steps of the Chemical Methods of Scale Removal Process, deposited during the flow of the Crude oil in Surface Facilities. | (CO4) | [Comprehension] |
| 14 | Elaborate on the effects of “Dissolved Gases” and “Oil in Water Emulsions” during the flow of crude oil to the oil and gas surface facilities. | (CO4) | [Comprehension] |

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| **PART C** | | | |
| **ANSWER ANY 2 QUESTIONS 2Q X 40M=20M** | | | |
| 15 | Innovative scale inhibition and removal techniques, such as chemical inhibitors and advanced mechanical cleaning, are essential to mitigate the costly impacts of scale formation and deposition in oil and gas surface facilities. As the industry shifts towards more sustainable practices, exploring environmentally friendly scale management solutions can revolutionize operational efficiency and reduce the environmental footprint of oil and gas production. Design an elaborative solution to remove scale using chemical methods in Oil and Gas Surface Facilities. | (CO2) | [Application] |
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| 16 | The presence of suspended solids and dissolved gases in oil and gas streams poses significant technical challenges, necessitating advanced filtration and separation technologies to prevent equipment fouling and ensure efficient processing. Additionally, managing dissolved gases like CO₂ and H₂S requires robust gas handling and removal systems to mitigate corrosion risks and maintain safety standards in surface facility operations. Formulate the process of a Petroleum Engineer overcoming technical challenges due to “Suspended Solids” and “Dissolved Gases” in designing oil and gas surface facilities. | (CO3) | [Application] |
| 17 | “Gravity separation” and “coalescence” demand precise engineering to effectively handle diverse fluid mixtures, posing challenges in achieving optimal phase separation efficiency. Innovations in coalescing materials and techniques could significantly enhance separation performance, driving sustainable oil and gas surface facility advancements.  (a) Explain the importance of “Gravity separation” in designing Surface Facilities. (10)  (b) Compose the effects of “coalescence” in designing Surface Facilities. (10) | (CO3) | [Application] |