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PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF ENGINEERING

MAKE-UP EXAMINATION - JULY 2024

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| **Semester: VI** | **Date: 02-07-2024** |
| **Course Code: PET214** | **Time: 9:30 AM-12:30 PM** |
| **Course Name: Surface Production Operations** | **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.*

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| **PART A** | | | |
| **ANSWER ANY 5 QUESTIONS 5Q X 2M=10M** | | | |
| 1 | List the factors affecting the design of a Free-Water Knock-Out drum. | (CO 1) | [Knowledge] |
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| 2 | Draw a schematic of a cross-sectional view of the Gun Barrel with internal gas boot and label all the sections. | (CO 1) | [Knowledge] |
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| 3 | Describe the need for Heaters to design an oil and gas surface facility. | (CO 2) | [Knowledge] |
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| 4 | Sketch the cutaway view of a horizontal direct-fired heater. | (CO 3) | [Knowledge] |
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| 5 | Draw a cutaway showing a typical fire tube that heats the emulsion of the heating and water wash section. | (CO 3) | [Knowledge] |
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| 6 | Tabulate the disposal standards for produced water in offshore operations worldwide. | (CO 4) | [Knowledge] |
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| 7 | Outline the dissolved solids in the waters produced along with the oil and gas streams. | (CO 4) | [Knowledge] |
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| **PART B** | | | |
| **ANSWER ANY 5 QUESTIONS 5Q X 10M=50M** | | | |
| 8 | Outline the need for an FWKO when designing an oil and gas surface facility with a properly labeled schematic. | (CO 1) | [Comprehension] |
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| 9 | Discuss the scenarios of using indirect and direct-fired heaters when designing an oil and gas surface facility with a properly labeled schematic. | (CO 1) | [Comprehension] |
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| 10 | The Figure below is a schematic of a Horizontal Heater-Treater. Redraw it and label each line with the appropriate identification from the group of devices located at the bottom of the Figure. | (CO 2) | [Comprehension] |
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| 11 | Explain the roles of “Demulsifiers” and the steps to the Bottle Test for selecting the “Demulsifiers”. | (CO 4) | [Comprehension] |
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| 12 | (a) Sketch a labeled Horizontal Electrostatic Desalter (Heater-Treater) schematic. (6)  (b) Describe the process of desalting crude oil. (4) | (CO 2) | [Comprehension] |
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| 13 | (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) | (CO 4) | [Comprehension] |
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| 14 | Design the steps of the Chemical Methods of Scale Removal Process, deposited during the flow of the Crude oil in Surface Facilities. | (CO 3) | [Comprehension] |
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| **PART C** | | | |
| **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** | | | |
| 14 | The formation of emulsions in oil and gas surface facilities can increase processing costs and reduce efficiency by complicating the separation of oil, water, and gas phases. Also, emulsions can cause equipment fouling and corrosion, increasing maintenance needs and potential operational downtime. Formulate the criteria of a Petroleum Engineer tasked with designing a Surface Facility to treat the emulsion formation during the flow of crude oil. | (CO 3) | [Application] |
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| 15 | Heater treaters are crucial in oil and gas surface facilities because they efficiently separate water and gas from crude oil, ensuring optimal downstream processing and transportation quality. Without heater treaters, emulsified water and gas could lead to significant operational inefficiencies, increased corrosion risks, and higher processing costs, challenging the economic viability of oil production. Formulate the different criteria for using Indirect & Direct Fired and Vertical & Horizontal Heater Treaters with properly labeled schematics. | (CO 2) | [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. | (CO 4) | [Application] |
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