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PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF INFORMATION SCIENCE

SUMMER TERM END TERM EXAMINATION - August 2024

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| **Semester : END TERM** | **Date : 06.08.2024** |
| **Course Code : PET2007** | **Time : 1:00 PM to 4:00 PM** |
| **Course Name** : Oil and Gas Surface Facility Design | **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 | List the factors affecting the design of a Free-Water Knock-Out drum. | (CO1) | [Knowledge] |
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| 2 | Draw a schematic of a cross-sectional view of FWKO and label all the sections. | (CO1) | [Knowledge] |
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| 3 | Draw a schematic of a cross-sectional view of the Gun Barrel with internal gas boot and label all the sections. | (CO1) | [Knowledge] |
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| 4 | State the use of Gun Barrel in designing an oil and gas surface facility. | (CO2) | [Knowledge] |
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| 5 | Describe the need for Heaters to design an oil and gas surface facility. | (CO2) | [Knowledge] |
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| 6 | Sketch the cutaway view of a horizontal indirect-fired heater. | (CO2) | [Knowledge] |
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| 7 | Sketch the cutaway view of a horizontal direct-fired heater. | (CO2) | [Knowledge] |
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| **PART B** | | | |
| **ANSWER ANY 3 QUESTIONS 3Q X 10M=30M** | | | |
| 8 | Outline the need for an FWKO when designing an oil and gas surface facility with a properly labeled schematic. | (CO1) | [Comprehension] |
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| 9 | Explain the need for a Gun Barrel when designing an oil and gas surface facility with a properly labeled schematic. | (CO2) | [Comprehension] |
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| 10 | Discuss the scenarios of using indirect and direct-fired heaters when designing an oil and gas surface facility with a properly labeled schematic. | (CO2) | [Comprehension] |
| 11 | The Figure below is a schematic of a Vertical Heater-Treater. Redraw it and label each line with the appropriate identification from the group of devices located at the top of the Figure. | (CO3) | [Comprehension] |
| 12 | 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. | (CO3) | [Comprehension] |
| 13 | Explain the “Emulsion Treating Theory” and the various factors affecting the stability of the Emulsions. | (CO4) | [Comprehension] |
| 14 | Explain the roles of Demulsifiers and the steps to the Bottle Test for selecting the Demulsifiers. | (CO4) | [Comprehension] |

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| **PART C** | | | |
| **ANSWER ANY 2 QUESTIONS 2Q X 40M=20M** | | | |
| 15 | 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. | (CO2) | [Application] |
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| 16 | Crude oil desalting systems are essential in oil and gas surface facilities to remove salts and other impurities that can cause corrosion and fouling in downstream equipment. Effective desalting improves the quality of crude oil, ensuring smoother refining processes and extending the lifespan of processing equipment. Being an upcoming petroleum engineer, design the process of Single- and Two-Stage Desalting systems using proper process flow diagrams. | (CO3) | [Application] |
| 17 | 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. | (CO3) | [Application] |