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PRESIDENCY UNIVERSITY BENGALURU

**SET A**

SCHOOL OF ENGINEERING

**END TERM EXAMINATION – MAY / JUNE 2024**

**Semester :** Semester VI - 2021

**Course Code :** PET2007

**Course Name :** Oil and Gas Surface Facility Design

**Program :** B.Tech.

**Date :** June 18, 2024

**Time :** 1.00 pm - 4.00 pm

# Max Marks : 100

**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.*

PART A

ANSWER ANY FIVE QUESTIONS 5QX2M=10M

1. Draw a schematic of a cross-sectional view of FWKO and label all the sections.

(CO3) [Knowledge]

1. Express the chemical process through which the Precipitated Solids may be treated in an Oil and Gas Surface Facility.
2. Sketch the cutaway view of a horizontal direct-fired heater.

(CO4) [Knowledge]

(CO3) [Knowledge]

1. Outline the dissolved solids in the waters produced along with the oil and gas streams.

(CO4) [Knowledge]

1. Draw a schematic of a cross-sectional view of the Gun Barrel with internal gas boot and label all the sections.

(CO3) [Knowledge]

1. Sketch the Baffles, installed in the coalescing section, causing the emulsion to follow a back- and-forth path up through the oil setting section.
2. Sketch the cutaway view of a horizontal indirect-fired heater.

(CO4) [Knowledge] (CO3) [Knowledge]

PART B

ANSWER ANY FIVE QUESTIONS 5QX10M=50M

1. (a) Assess the importance of crude oil desalting. (4)
   1. Draw the labeled process flow diagrams of single and 2-stage desalting systems. (3+3=6)

(CO3) [Comprehension]

1. (a) Sketch a labeled Horizontal Electrostatic Desalter (Heater-Treater) schematic. (6)
   1. Describe the process of desalting crude oil. (4)

(CO4) [Comprehension]

1. Explain the roles of Demulsifiers and the steps to the Bottle Test for selecting the Demulsifies.

(CO3) [Comprehension]

1. Design the steps of the Chemical Methods of Scale Removal Process, deposited during the flow of the Crude oil in Surface Facilities.

(CO4) [Comprehension]

1. Explain the “Emulsion Treating Theory” and the various factors affecting the stability of the Emulsions.

(CO3) [Comprehension]

1. (a) Summarize the importance of produced water treatment in oil and gas surface facilities. (4)
   1. List the disposal standards for water produced in offshore and onshore regions. (3+3=6)

(CO4) [Comprehension]

1. Outline the need for an FWKO when designing an oil and gas surface facility with a properly labeled schematic.

(CO3) [Comprehension]

PART C

ANSWER ANY TWO QUESTIONS 2QX20M=40M

1. 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]

1. “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.
2. Explain the importance of “Gravity separation” in designing Surface Facilities. (10)
3. Compose the effects of “coalescence” in designing Surface Facilities. (10)

(CO4) [Application]

1. 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.

(CO3) [Application]