Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY 2025

Date: 29-05-2025 **Time:** 09:30am – 12:30pm

School: SOE	**Program:** B. Tech-PET	
Course Code : PET2007	**Course Name:** Oil and Gas Surface Facility Design	
Semester: VI	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**
Marks	**24**	**24**	**26**	**26**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Define stage separation in oil and gas facility.	**2 Marks**	**L1**	**CO1**
2.	List two advantages of horizontal separator.	**2 Marks**	**L1**	**CO1**
3.	Describe mist elimination and its importance.	**2 Marks**	**L1**	**CO2**
4.	Recall an electrostatic heater-treater design with a rough sketch.	**2 Marks**	**L1**	**CO2**
5.	Define demulsifiers with examples.	**2 Marks**	**L1**	**CO3**
6.	State the disposal standards for produced water in onshore operations.	**2 Marks**	**L1**	**CO3**
7.	Define "retention time" in separator sizing.	**2 Marks**	**L1**	**CO3**
8.	Recall the use of oil desalting systems in produced water treatment.	**2 Marks**	**L1**	**CO4**
9.	Define produced water. Name atleast 4 contaminants found in it.	**2 Marks**	**L1**	**CO4**
10.	Identify the purpose of a coalescer in produced water treatment.	**2 Marks**	**L1**	**CO4**

Part B

Answer the Questions. **Total Marks 80M**

11.	Explain the construction of a three-phase horizontal and vertical separator with the help of clearly labeled schematic diagrams. Discuss the function and key components of each type, highlighting how they facilitate the separation of oil, water, and gas in surface production facilities.	**20 Marks**	**L2**	**CO1**
	Or			
12.	**a**. Explain FWKO with a properly labeled schematic. b. Explain gunbarrel tanks, and explain the process of emulsion separation within these systems.	**20 Marks**	**L2**	**CO1**

13.	Produced water is a major by-product in oil and gas production, requiring effective treatment before disposal or reuse. Discuss the key characteristics of produced water, the common treating equipment used in oil and gas facilities, and the disposal standards for produced water in both onshore and offshore environments.	**20 Marks**	**L2**	**CO2**
	Or			
14.	Emulsion formation in crude oil production can hinder phase separation, cause corrosion and fouling, and increase processing costs. As a Petroleum Engineer, describe the key considerations in designing a surface facility to treat emulsions. Include the causes and types of emulsions, common treatment methods, and important design features for effective separation.	**20 Marks**	**L2**	**CO2**

15.	Apply the given data to design a three-phase horizontal separator. Oil flow rate = 4,000 bopd Water flow rate = 3,000 bwpd Gas flow rate = 5 MMSCFD Operating pressure = 100 psia Operating temperature = 80°F Oil gravity = 25° API $(S.G.)_w$ = 1.07 $(S.G.)_g$ = 0.6 Oil viscosity = 10 cp	**20 Marks**	**L3**	**CO4**

	Assume, drag coefficient, C_D = 0.851 Compressibility factor, z = 0.84 Retention time, $(t_r)_o = (t_r)_w$ = 10 min β= 0.257 Oil droplet size = 100 micron Water droplet size = 500 micron Based on these data calculate separator size, seam to seam length and slenderness ratio, assume the vessel internal diameter ranging from 60 to 108 inches.			
	Or			
16.	Apply the given data to design a three-phase vertical separator. Oil flow rate = 4,000 bopd Water flow rate = 3,000 bwpd Gas flow rate = 5 MMSCFD Operating pressure = 100 psia Operating temperature = 80°F Oil gravity = 25° API $(S.G.)_w$ = 1.07 $(S.G.)_g$ = 0.6 Oil viscosity = 10 cp Assume, drag coefficient, C_D = 0.851 Compressibility factor, z = 0.84 Retention time, $(t_r)_o = (t_r)_w$ = 10 min β= 0.257 Oil droplet size = 100 micron Water droplet size = 500 micron Based on these data calculate separator size, seam to seam length and slenderness ratio, assume the vessel internal diameter ranging from 84 to 102 inches.	**20 Marks**	**L3**	**CO4**

17.	Identify and derive the equations for gas and liquid capacity in the sizing of a two phase horizontal separator. Discuss a step-by-step procedure for sizing a two phase horizontal separator, explaining the key parameters and design considerations.	**20 Marks**	**L2**	**CO3**
	Or			
18.	Summarize the equation for the terminal settling velocity of a droplet under laminar flow conditions using Stokes' Law.	**20 Marks**	**L2**	**CO3**