Roll No.											

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 09- 12-2025 **Time:** 01:00pm – 04:00pm

School: SOE	**Program:** B. Tech-PET	
Course Code: PET2023	**Course Name:** Design in Production Engineering	
Semester: VII	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Marks	**-**	**20**	**20**	**20**	**20**	**20**

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.	Identify the factor that controls shot density during perforating.	**2 Marks**	**L1**	**CO2**
2.	State the purpose of test-rack opening pressure measurement.	**2 Marks**	**L1**	**CO2**
3.	Describe bottle emulsion test.	**2 Marks**	**L1**	**CO2**
4.	Define a heater treater in upstream oil processing.	**2 Marks**	**L1**	**CO2**
5.	Name and define any two parts of a heater treater	**2 Marks**	**L1**	**CO2**
6.	List two common emulsion-treating mechanisms inside a heater treater.	**2 Marks**	**L1**	**CO2**
7.	Define a shell-and-tube heat exchanger use in surface production facilities.	**2 Marks**	**L1**	**CO2**
8.	List the advantages of fixed tube and floating head heat exchanger.	**2 Marks**	**L1**	**CO2**
9.	Name and define any two parts of a shell and tube heat exchanger.	**2 Marks**	**L1**	**CO2**
10.	Label a fixed head shell and tube heat exchanger.	**2 Marks**	**L1**	**CO2**

Part B

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

11.	**a.**	Explain, using appropriate schematics, the graphical method employed to determine the gas injection point in a continuous gas lift system.	**8 Marks**	**L2**	**CO3**
	b.	In an oil field, all gas lift has casing pressure operated charged valve. The operating valve is located at 7500 ft depth. The pressure in the bellow is 900 psi and the tubing pressure is 700 psi at 7500 ft valve depth, the bellow area is 1 sq. inch & port size is 0.1 sq inch. The bellow pressure at 50°F is 600 psi. Calculate the following using the given data: **a)** Casing pressure at valve depth required to open the valve. **b)** Tubing effect factor. **c)** Tubing effect. **d)** Valve spread. **e)** Test rack opening pressure of valve. **f)** Bellow effect.	**12 Marks**	**L3**	**CO3**
		Or			
12.	**a.**	Summarize the different types of gas lift valves and, using a schematic diagram, describe the key components of a gas lift valve.	**8 Marks**	**L2**	**CO3**
	b.	In an oil field, all gas lift has casing pressure operated charged valve. The operating valve is located at 8000 ft depth. The pressure in the bellow is 800 psi and the tubing pressure is 600 psi at 8000 ft valve depth, the bellow area is 1 sq. inch & port size is 0.1 sq inch. The bellow pressure at 60°F is 580 psi. Calculate the following using the given data: **a)** Casing pressure at valve depth required to open the valve. **b)** Tubing effect factor. **c)** Tubing effect. **d)** Valve spread. **e)** Test rack opening pressure of valve. **f)** Bellow effect.	**12 Marks**	**L3**	**CO3**

13.	**a.**	Summarize, with the help of a neat schematic, the working principle of a horizontal heater treater used in oilfield emulsion treatment. Explain how heat application, fluid-flow	**20 Marks**	**L2**	**CO4**

		arrangement, and gravity settling combine to break water-in-oil emulsions inside the heater treater.			
	b.	Explain the ways in which agitation during oil production promotes the creation and persistence of water-in-oil emulsions. Describe how natural emulsifying agents stabilize dispersed water droplets, and outline how demulsifiers are assessed and selected using the bottle test procedure for effective emulsion breaking.		**L2**	**CO4**
Or					
14.	**a.**	Describe, with the help of a suitable schematic, the working principle of a vertical heater treater used in oil–water separation. Describe how heat application, electrostatic coalescence, and gravity settling work together to break water-in-oil emulsions inside the vessel.	**20 Marks**	**L2**	**CO4**
	b.	Explain what desalters are and describe the process of crude oil desalting used to remove salts and residual water from produced crude. Further, distinguish between single-stage and two-stage desalting by outlining their operation and relative efficiency.		**L2**	**CO4**

15.	Interpret the required sizing of a vertical heater treater for a retention time of 10, 15 and 20 minutes, using the following parameters: crude oil gravity of 40°API, oil specific gravity of 0.875, water specific gravity of 1.04, an oil flow rate of 2000 bpd, and an inlet oil temperature of 90 °F. Further investigate the heater treater performance at operating temperatures of 80 °F, 100 °F, and 130 °F by considering the corresponding oil viscosities of 41 cp, 19 cp, and 10 cp respectively.	**20 Marks**	**L3**	**CO5**
Or				
16.	Calculate the required sizing of a horizontal treater for a retention time of 10, 15 and 20 minutes, using the following parameters: crude oil gravity of 30°API, oil specific gravity of 0.7, water specific gravity of 1.08, an oil flow rate of 4000 bpd, and an inlet oil temperature of 85 °F. Further investigate the heater treater performance at operating temperatures of 85°F, 95°F, and 125°F by considering the corresponding oil viscosities of 41 cp, 19 cp, and 10 cp respectively.	**20 Marks**	**L3**	**CO5**

17.	Breakdown the steps involved in sizing a shell-and-tube heat exchanger and analyze how each step (heat duty determination, LMTD evaluation, fouling factor selection, and overall heat-transfer estimation) governs the final design in surface production facilities.	**20 Marks**	**L4**	**CO6**
Or				

18.	Examine how variations in crude-oil properties (viscosity, specific heat, and API gravity) alter exchanger sizing calculations, and evaluate their impact on exchanger area, number of passes, and required heat duty.	**20 Marks**	**L4**	**CO6**