Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY 2025

Date: 27-05-2025 **Time:** 09:30 am – 12:30 pm

School: SOE	**Program:** B. Tech (PET)	
Course Code: PET2011	**Course Name:** Oil and Gas Downstream Operations	
Semester: VI	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	20	20	30	30	N.A.

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 2 marks. **10Q x 2M=20M**

1.	Recall the importance of shock or shield section in pipe still heater.	**2 Marks**	**L1**	**CO3**
2.	Select the correct answer from the following options: The distillation process in a petroleum refinery is a- A) Physical separation process not a chemical process B) Chemical separation process not a physical process C) Both, physical and chemical process D) None of the above	**2 Marks**	**L1**	**CO3**
3.	Recognize the correct answer: Height of the vacuum distillation column for an industrial-scale applications is generally maintained up to about _____ meter. A) 75 B) 65 C) 55 D) 50	**2 Marks**	**L1**	**CO3**

4.	Generally packing material is used in a vacuum distillation column (VDU) rather than using of tray. State the importance of packing materials in VDU.	**2 Marks**	**L1**	**CO3**
5.	Identify the correct answer: Isomerization process is used to convert A) Naphthenes to Aromatics by removing H_2 B) Aromatics to Naphthenes by removing H_2 C) Straight chain alkanes to branched alkanes D) Branched alkanes to straight chain alkanes	**2 Marks**	**L1**	**CO3**
6.	State three differences between coil vis-breaking and soaker vis-breaking process.	**2 Marks**	**L1**	**CO4**
7.	Imagine you are a petroleum engineer working in the catalytic cracking (CC) section of a refinery. You are using an alumina supported cobalt-molybdenum (Co-Mo) catalyst for the cracking reaction. Typically, a fresh catalyst is expected to have a lifespan of 1 to 2 years. However, after just six months, you have noticed a decline in the production rate from the CC unit. Identify the likely reasons for this decline and discuss potential ways to address the challenges.	**2 Marks**	**L1**	**CO4**
8.	Identify the correct answer from the options as given below: In the delayed coking process, the Coker drum temperature is to be maintained between- A) 450°C-480°C B) 470°C-500°C C) 510°C-540°C D) 480°C-510°C	**2 Marks**	**L1**	**CO4**
9.	Reproduce the schematic diagram of coil type vis-breaking process and label all process equipment and flow directions. (No discussion is required)	**2 Marks**	**L1**	**CO4**
10.	Describe Flue gas and the compositions that come out from the Fluid catalytic cracking (FCC) unit.	**2 Marks**	**L1**	**CO4**

Part B

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

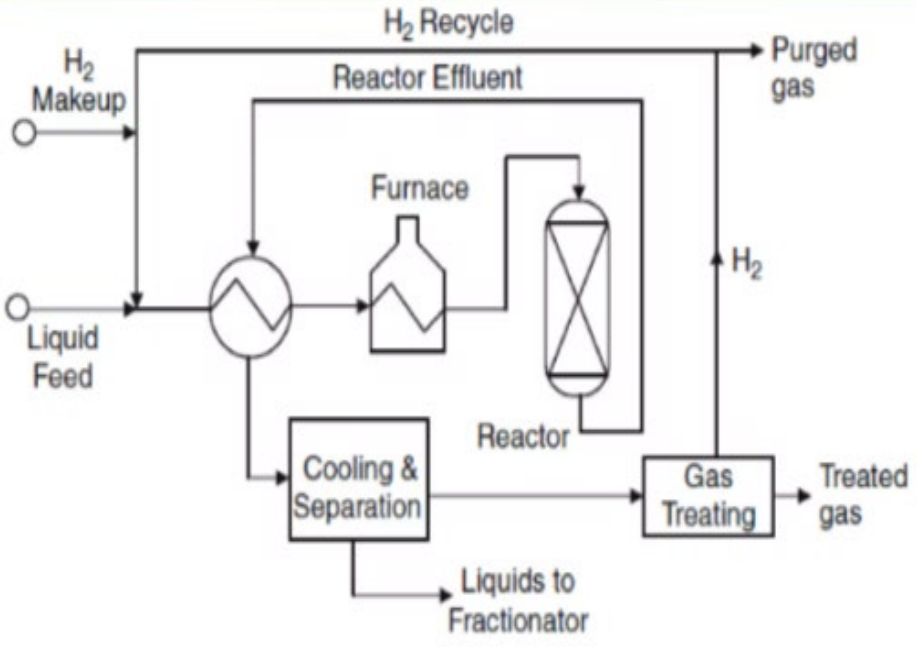
11.	**a.**	In crude oil "sulfur compounds are classified according to their corrosive effects" one is the active sulfur compounds and another one is inactive sulfur compounds. Explain in detail the characteristics of active sulfur compounds in crude oil. Similarly,	**10 + 10 Marks**	**L2**	**CO1**

		describe the properties and significance of inactive sulfur compounds.			
	b.	Hydrocracking is a vital process in petroleum refining, aimed at converting heavy feedstocks into more valuable products. There are different configurations of hydrocracking units, namely: • Single-stage hydrocracking unit • Single-stage recycle hydrocracking unit • Two-stage hydrocracking unit With the help of suitable schematic flowcharts, discuss each of these configurations in detail.		**L2**	**CO1**
Or					
12.	**a.**	Gas cracking is an important industrial process used to produce lighter hydrocarbons from heavier feedstocks. Explain in detail the various steps involved in the gas cracking process, describing the sequence of operations from feed preparation to product recovery. Discuss the key process variables such as temperature, pressure, residence time, and type of feedstock, and explain how each variable influences the efficiency and outcome of the cracking process.	**10 + 10 Marks**	**L2**	**CO1**
	b.	Gas reforming is a fundamental chemical process widely used for the production of synthesis gas (syngas) and other valuable products. Discuss in detail the gas reforming process, clearly explaining the sequence of chemical reactions involved. Also explain its three benefits.		**L2**	**CO1**

13.	**a.**	Describe elaborately chemical compositions and physical properties of Diesel.	**10 + 10 Marks**	**L2**	**CO2**
	b.	Explain elaborately the specification and applications of poly vinyl chloride (PVC).		**L2**	**CO2**
Or					
14.	**a.**	Explain industrial specifications and applications of high density poly ethylene (HDPE).	**10 + 10 Marks**	**L2**	**CO2**
	b.	With the help of suitable diagram discuss the vinyl chloride monomer (VCM) manufacturing process and polymerization of the VCM.		**L2**	**CO2**

15.	**a.**	Heat exchangers and heaters are essential equipment in petroleum refining and chemical industries for effective heat transfer and energy management. With the help of suitable diagrams, explain the working principles of the following equipment: • Heat Exchanger • Box-Type Pipe Still Heater • Cylindrical Pipe Still Heater For each type, describe the constructional features and mechanisms of heat transfer.	**10 + 10 Marks**	**L2**	**CO3**
	b.	The Vacuum Distillation Unit (VDU) plays a critical role in petroleum refining by separating heavier fractions under reduced pressure. With the help of a clear schematic diagram, describe the process steps involved in the operation of a Vacuum Distillation Unit (VDU). (Describe the process in your own words)		**L2**	**CO3**
Or					
16.	**a.**	Describe the interior process that occurs inside the ADU with a net sketch. (describe the process with your own words)	**10 + 10 Marks**	**L2**	**CO3**
	b.	With a suitable sketch discuss single stage desalter and two stage desalter process. Also explain the importance of desalters. (Describe the process in your own words)		**L2**	**CO3**

17.	**a.**	Vis-breaking is an important thermal cracking process used in petroleum refining to reduce the viscosity of heavy residual oils. With the help of well-labeled schematic diagrams, discuss in detail the following two types of vis-breaking processes: • Simple Vis-breaking Process • Soaker Vis-breaking Process	**10 + 10 Marks**	**L2**	**CO4**
	b.	Explain the delayed coking process with a suitable diagram. Also describe key benefits and disadvantages of the delayed coking process.		**L2**	**CO4**
Or					
18.	**a.**			**L2**	**CO4**

		 • Identify and summarize the objectives, flow diagram details of process that is shown in the above figure. • Explain the hydrofining process with a suitable schematic diagram.	**10 + 10 Marks**		
	b.	With a flow diagram describe the hydrocracking process and its three basic principles. (Describe the process in your own words)		**L2**	**CO4**