	COLLEGE OF ENGINEERING **JAZAN UNIVERSITY** **CHEMICAL ENGINEERING** **DEPARTMENT**	**SECOND Midterm Exam (online)**	
		Semester: 20212. **Room No.:**	**Date:** **Day:** 24 hours
		Course Code: 471CHE-4	**Time:** online
		Course Title: Petrochemical Engineering	**Max Marks:** 15
		Instructor: Dr. Mohammad Ashraf Ali	**Number of pages:** 6

Student Name:	Akram Saidan Maashi		
Student ID:	**201706064**		
Section:	……..…....	**Serial Number/Room Number**	6

Question #	CLOs	Question Mark	Student Mark
1	**CLO (# 1):** an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics .	**2**	
2	**CLO (# 1):** an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics .	**3**	
3	**CLO (# 7):** an ability to acquire and apply new **knowledge** as needed, using appropriate learning strategies.	**3**	
4	**CLO (# 7):** an ability to acquire and apply new **knowledge** as needed, using appropriate learning strategies.	**3**	
5	**CLO (# 7):** an ability to acquire and apply new **knowledge** as needed, using appropriate learning strategies.	**4**	
Total		**15**	

Advice to Candidates

1. *Write Student Name, Student ID & Serial No. on the question paper.*
2. *You should write your answers clearly.*
3. *Pencils are not allowed. Use Pens!*
4. *Allocate your time wisely. Use the number of marks assigned to each problem as pointed.*
5. *In order to get full marks on a question, you must show ALL your work!*
6. *You are not allowed to use programmable CALCULATORS or smart WATCHES.*
7. *During an exam session, your mobile must be completely switched off. Otherwise, a default cheating case will be reported.*
8. *You are not allowed to use any kind of paper material during an exam session.*
9. *It is the student's responsibility to ensure that there are no written texts on his desk, body, or clothes; otherwise, he has to inform the invigilators.*

Question 1 (CLO (# 1)):

2 marks

a. What are the differences between LLDPE and LDPE in terms of manufacturing conditions and their properties.

b. Why HDPE has higher strength than LDPE? How much strong is HDPE?

c. Name the following two polymers A and B and explain their manufacturing processes, properties and uses.

A.

B.

Question 2 (CLO (# 1)

3 marks

a. Describe the Polybutadiene Manufacturing Process and draw its diagram.

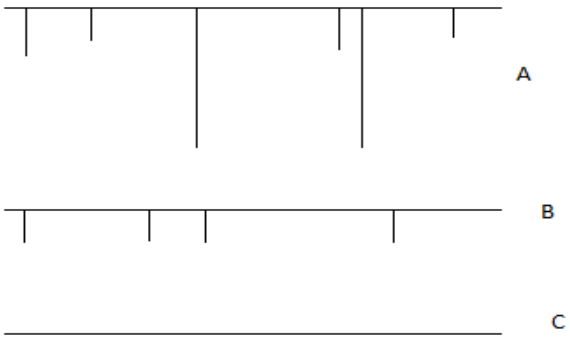
b. Describe the Manufacturing Process of PTFE and draw its process diagram.

c. Draw the PVC Manufacturing Process Diagram and describe the process.

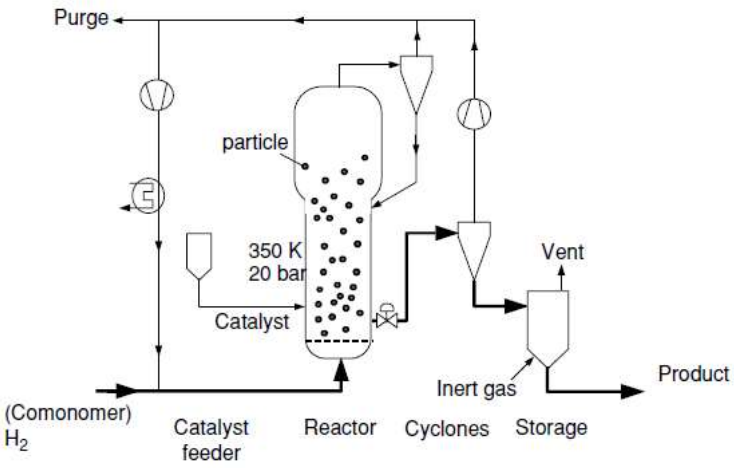
Question 3 (CLO (# 7)

3 marks

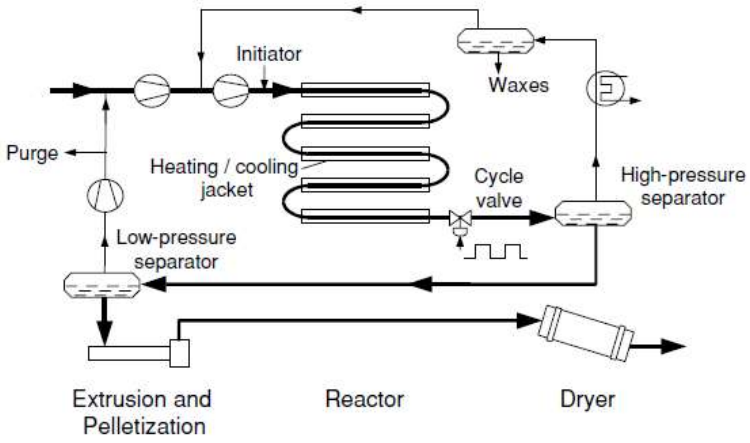
a. The figure below shows representation of the three backbone structures of HDPE, LDPE and LLDPE polyethylene. Assign the proper names to A, B and C and mention their density values.



b. Which type of polyethylene is produced in the process diagram given below. Explain the manufacturing process.



c. Which type of polyethylene is produced in the process diagram given below. Explain the manufacturing process.



Question 4 (CLO (# 7)

3 marks

a. Fill in the blanks (?).

Reactant	Polymer	Process	Phase	Catalyst	T (K)	p (bar)
?	LDPE	Solution or bulk, PFR or CSTR	Liquid	None, H_2O_2 as initiator	470–570	?
Ethene	?	Suspension, fluidized bed	Liquid	$TiCl_4$ or Cr- oxide	?	20–35
?	LLDPE	Solution, fluidized bed	Vapor	$TiCl_4$ (or Cr oxide)	100	?

b. What is the purpose of adding hydrogen in the Polyethylene manufacturing process. What do you think will happen in the absence of hydrogen gas.

c. What kind of impurities are present in the ethene and propene feeds used for polymerization? What is the maximum purity required for polymer grade ethene and propene.

Question 5 (CLO (# 7)

4 marks

a. What different Technologies are available to Produce butadiene. What are the chemicals produced from butadiene and their uses?

b. What are the sources and derivatives of propylene. What consumer products are made from polypropylene?

c. Draw the process for aromatics (BTX) extraction using sulfolane solvent. Describe the extraction process. What other processes are used to produce BTX.