Name:

Enrolment No:

UPES

End Semester Examination, December 2023

Course: Petrochemical Processing Technology **Semester: V**

Program: B.Tech (Chemical Engineering) **Time : 03 hrs.**

Course Code: CHCE3044 **Max. Marks: 100**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Classify the petrochemicals with an example for each.	**4**	**CO1**
Q 2	Name the first generation petrochemical and the process by which each of the following second generation petrochemicals is produced. (a) Acrylonitrile (b) Linear Alkyl Benzene (c) Terephthalic acid (d) Cyclohexane	**4**	**CO1**
Q 3	Name the drivers for the integration of refinery operation with petrochemicals production.	**4**	**CO4**
Q 4	Calculate the relative rate of formation of ethylene to butane at 950 K with the following data. R = 8.314 J/mol K. Reaction: $\dot{C}_4H_7 \rightarrow C_4H_6 + \dot{H}$, A ($s^{-1}$) = 1.2×10^{14}, E (kJ/mole) = 206.4 Reaction: $\dot{C}_4H_7 \rightarrow C_2H_4 + \dot{C}_2H_3$, A ($s^{-1}$) = 1.0×10^{11}, E (kJ/mole) = 154.9	**4**	**CO1**
Q 5	Give the name of one renewable source each for the manufacture of four petrochemicals.	**4**	**CO1**

SECTION B
(4Qx10M= 40 Marks)

Q 6	With the help of flow diagram explain the manufacture of methanol from syngas and analyze the reaction conditions favoring the desirable and undesirable reactions.	**10**	**CO2 & CO3**
Q 7	Draw the process flow diagram of production of styrene and analyze the various steps involved. **(Or)** Name any four second generation petrochemicals derived from olefins and describe the production of any one of them with the help of the flow diagram.	**10** **10**	**CO2 & CO3**

Q 8	Acrylonitrile is polymerized by anionic addition polymerization using n-butyl lithium as initiator which ionizes to 100%. The initial concentration of monomer and initiator are 1.9 X 10^{-2} and 2.5 X 10^{-7} mol/L respectively. The propagation rate constant is 3.9 X 10^{-6} $L.mol^{-1}s^{-1}$. Calculate the time required for the 70% completion of polymerization. Give the mechanism of alkylation reaction.	**10**	**CO1**
Q 9	Name any four biochemicals as substitute to petrochemicals. Analyze the process technology of any one of its production in comparison with the production of its petrochemical counterpart.	**10**	**CO4**
SECTION-C (2Qx20M=40 Marks)			
Q 10	(a) Draw and explain the process flow diagram of separation of aromatics into pure components. (b) Explain the treatment of natural gas for the separation of natural gas liquid	**10** **10**	**CO2 & CO3**
Q 11	(a) Draw the process flow diagram and explain the manufacture of any one of the synthetic fiber. (b) List the processes available to produce syngas and give a critical comparison of them. **(Or)** (a) Name any three synthetic rubber and describe the production of any one of them with the help of flow diagram. (b) Compare the process technology for the production of a petrochemical from a renewable source and conventional petroleum source.	**10** **10** **10** **10**	**CO2 & CO3** **CO4** **CO2 & CO3** **CO4**