

# GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-V EXAMINATION – WINTER 2025

**Subject Code:3150509**

**Date:17-11-2025**

**Subject Name:Fuels and Combustion**

**Time:10:30 AM TO 01:00 PM**

**Total Marks:70**

**Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	MARKS
<b>Q.1</b> (a) Draw a line diagram for the classification of fuel.	<b>03</b>
(b) Define octane number and cetane number and discuss their significance.	<b>04</b>
(c) Discuss in detail about the present scenario of crude oil refineries in India. Also, state the consumption pattern of petroleum crude in India.	<b>07</b>
<b>Q.2</b> (a) Explain the term coal mining. Enlist various types of coal mining.	<b>03</b>
(b) Differentiate between direct and Indirect coal liquefaction processes with suitable examples.	<b>04</b>
(c) Enlist various coal combustion technologies. Explain circulating fluidized bed combustion technique for the combustion of bituminous coal.	<b>07</b>
<b>OR</b>	
(c) Describe briefly H-coal process. List out the advantages of ebulated bed reactor over the fixed bed reactor	<b>07</b>
<b>Q.3</b> (a) Write short note on exploration of crude petroleum.	<b>03</b>
(b) Explain vis-breaking. Also list the various products of vis-breaking unit.	<b>04</b>
(c) Describe vacuum distillation unit with neat flow sheet for crude distillation.	<b>07</b>
<b>OR</b>	
<b>Q.3</b> (a) Write short note on improved oil recovery (IOR).	<b>03</b>
(b) Explain hydro-cracking. Also list the various products of hydro-cracking unit.	<b>04</b>
(c) Describe delayed coking process used in the petroleum refinery with neat flow sheet.	<b>07</b>
<b>Q.4</b> (a) Define agro fuel with suitable examples.	<b>03</b>
(b) Explain the storage, handling and safety of water gas.	<b>04</b>
(c) Describe the synthesis of producer gas with all the chemical reactions involved and flow diagram.	<b>07</b>

**OR**

- Q.4** (a) Define biogas with its chemical composition. **03**  
(b) Explain the storage, handling and safety of acetylene gas. **04**  
(c) Enlist the various methods for the production of hydrogen gas. Describe the steam reforming process for the synthesis of hydrogen with all the chemical reactions involved. **07**

- Q.5** (a) Enlist the various characteristics of an efficient furnace. **03**  
(b) State the two advantages and disadvantages of pulverized fuel firing. **04**  
(c) Write short note on adiabatic flame temperature, calorific value of coal, air to fuel ratio and dew point of products. **07**

**OR**

- Q.5** (a) Define oxy-rich combustion. **03**  
(b) Define turn down ratio of burner. State the various types of gas burner with their applications. **04**  
(c) Discuss the working and industrial application of traveling grate stoker boiler. **07**

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