

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

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**
