Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - IV EXAMINATION - WINTER 2025

Subject Code: 3144401 **Date: 26-11-2025**

Subject Name: Fuel and Combustion

Time: 02:30 PM TO 05:00 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	**(a)**	Define a fuel and state its importance in chemical industries.	**03**
	(b)	Explain the procedure for determination of moisture and ash content in proximate analysis.	**04**
	(c)	Compare solid, liquid, and gaseous fuels in terms of calorific value, ease of transport, combustion efficiency, and storage.Suggest the best type of fuel for industrial boilers with justification.	**07**
Q.2	**(a)**	Define calorific value (CV) and distinguish between GCV and NCV.	**03**
	(b)	Discuss the construction and working of a by-product coke oven.	**04**
	(c)	With a neat flow diagram, explain coal gasification and the steps in synthetic fuel production from coal.	**07**
		OR	
	(c)	Discuss about the coal combustion techniques such as (a) Fixed-bed, (b) Fluidized-bed, and (c) Pulverized-fuel combustion.	**07**
Q.3	**(a)**	Write short notes on coal tar distillation products.	**03**
	(b)	Describe the steps involved in coal mining and preparation.	**04**
	(c)	Describe in detail the petroleum refining process with a neat flow diagram showing different fractions and their uses.	**07**
		OR	
	(a)	What is meant by petroleum refining?	**03**
	(b)	Compare octane and cetane numbers. Explain their significance in fuel performance.	**04**
	(c)	Describe in detail the petroleum refining process with a neat flow diagram showing different fractions and their uses.	**07**
Q.4	**(a)**	Mention three important properties of good liquid fuels.	**03**
	(b)	Describe the manufacture of producer gas and state its advantages and limitations.	**04**

	(c)	Explain with neat diagrams the production and purification of biogas. Discuss its advantages as a renewable energy source.	**07**

OR

	(a)	What is LPG? Mention its main components and uses.	**03**
	(b)	Write short notes on hydrogen and acetylene as fuel gases and their industrial applications.	**04**
	(c)	Discuss in detail the production, composition, and applications of producer gas and water gas. Compare their efficiencies and limitations.	**07**
Q.5	**(a)**	Define air-fuel ratio and stoichiometric air requirement.	**03**
	(b)	Discuss the principle and working of Orsat apparatus used for flue gas analysis.	**04**
	(c)	Describe in detail the working of fluidized bed combustion (FBC) and circulating fluidized bed boiler (CFB) systems. Discuss their advantages over conventional firing systems.	**07**

OR

	(a)	What are heat treatment furnaces and their industrial uses?	**03**
	(b)	Discuss pulverized coal firing system with a neat diagram.	**04**
	(c)	A gaseous fuel has the composition: C = 85%, H = 10%, O = 5%. Calculate: (a) Theoretical air required for complete combustion, (b) Composition of dry flue gases.	**07**

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