Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2023

Subject Code:3150509 Date:05-12-2023

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.**

Q.1	**(a)**	What is coal mining? State the types of mining and basic system of production techniques for mining.	**03**
	(b)	Discuss about the measurement techniques for petroleum fractions.	**04**
	(c)	With neat sketch explain the drilling process of petroleum and natural gas.	**07**
Q.2	**(a)**	What is carbonization? How it is being carried out? State the different types of carbonization.	**03**
	(b)	Briefly describe the gasification process for coal.	**04**
	(c)	Discuss the different types of coal combustion techniques.	**07**
		OR	
	(c)	Name the methods to assess the quality of coal and explain any one in detail.	**07**
Q.3	**(a)**	State the different types of refinery equipments along with their uses.	**03**
	(b)	Write a brief note on storage and handling of liquid fuel.	**04**
	(c)	What is dewaxing? Discuss the different types of dewaxing processes.	**07**
		OR	
Q.3	**(a)**	Briefly explain the different reaction occur during the steam reforming.	**03**
	(b)	Discuss about the safety and handling of acetylene gas.	**04**
	(c)	What is water gas? Discuss the different reactions involved in the production of water gas.	**07**
Q.4	**(a)**	List out the various characteristics of a good fuel.	**03**
	(b)	Explain the handling and storage of agro fuels.	**04**
	(c)	Classify the bio fuels. Discuss the production process, technologies and applications of bio fuels.	**07**
		OR	
Q.4	**(a)**	Write down the basic chemical equations for complete combustion of fuel.	**03**
	(b)	Derive the equation for constant pressure adiabatic flame temperature process.	**04**
	(c)	A petrol sample was found to have 86% carbon and 14% hydrogen by mass. When used in an engine the air supply is 90% of that theoretically required for complete combustion. Assuming that all the hydrogen is burnt and that the carbon burns to carbon monoxide and carbon dioxide so that there is no free carbon left, calculate the percentage analysis of dry exhaust gases by volume.	**07**
Q.5	**(a)**	List out the factors affecting the rate of combustion process.	**03**
	(b)	Briefly explain about flame structure, propagation and flammability limit.	**04**
	(c)	Determine the air–fuel ratio on both a molar and mass basis for the complete combustion of octane, C_8H_{18}, with (i) the theoretical amount of air and (ii) 150% theoretical air (50% excess air).	**07**

OR

Q.5	**(a)**	State any three industrial applications of batch and continuous furnaces.	**03**
	(b)	Explain the working of fluidized bed combustion process.	**04**
	(c)	Define enthalpy of combustion and formation. Derive the expression for the first law analysis of reacting system for the steady flow processes	**07**

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